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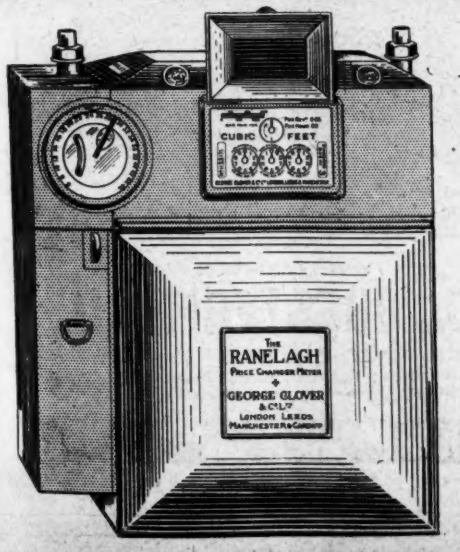

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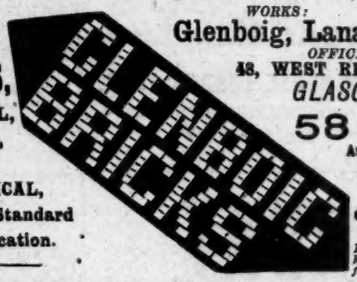

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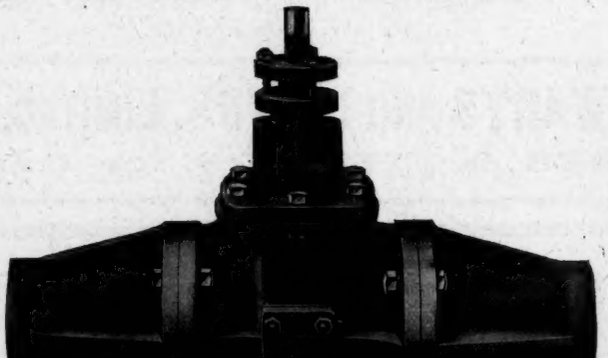

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EDITORIAL NOTES.

The Income-Tax.

THE "burden of taxation" has been a long and a loud cry. The weight of the burden has been (shall we say?) largely necessary. It has, however, been a check to industrial and commercial enterprise, and, to the extent that it has been so, the country has suffered in its revenue-producing capacity. Such a check should be lessened as promptly as possible, and to the utmost extent. Though continually protesting, the country has been very patient, and has scrupulously met its obligations. Now the time has come when the existing state of things cannot be allowed to continue. Compelled by the force of circumstances in respect of industry and the conditions of unemployment, the Chancellor of the Exchequer (Sir Robert Horne) has had to choose between the alternatives of making a beginning in lightening the weight of taxation or maintaining the policy of debt redemption. He has selected (as he announced in his Budget speech in the House on Monday last week) temporarily to abandon the debt redemption, and to reduce the standard income-tax by 1s. in the pound, thus making it 5s. This is still much too heavy; and what has now been done can only be regarded as the initial move in assisting the country to become more prosperous. It is generally conceded by the authorities in the financial world and by industrial and commercial magnates that the Chancellor has taken the right course, though even the temporary suspension of debt redemption is regrettable. Even so, it is the effect in the long run that matters; and the partial relief to industry and trade will serve as an incentive, and help to produce the industrial and trading activity that is necessary to enable the country the better to meet its obligations. In other directions, the postal and telephone reductions will also assist in the industrial and trade invigorating process.

From all this the gas industry will reap advantage. The less the taxation restrictions upon industry and trade, and the higher the levels at which industry and trade are working, the larger the scope for the gas and secondary products business of the gas industry. The reduction of the income-tax should also have a direct beneficial effect upon the industry. It should do so, too, upon the market values of gas stocks and shares. With 1s. in the pound less to be deducted at the source of dividend, there will be that 1s. more per 1 p.ct. of dividend to reach the holders of stocks or shares. In some respects they are fortunate in having the tax deducted at the source. The man who pays taxes directly will receive no benefit from the present reduction until January next; his assessment at the present time being based on last year's budget. Those whose incomes are taxed at the source will receive an immediate benefit from the reduction, or whenever the tax is deducted—all dividends or proportions of dividends accruing after April 6 this year being charged with income-tax at the new rate. This immediate advantage should have prompt reflection in enhanced market values.

An important change is being made in the working of the machinery of collection. In future not only wage earners but all salaried employees are to pay on the actual earnings of the year of assessment, and not on a three years' average as hitherto. There are arguments for and against this; but, on the whole, the change is viewed favourably—especially by those who have been receiving bonuses, which are in amount on the decline. There has been a question as to whether the salaries and remuneration of employees in joint-stock companies and the like should, in respect of income-tax assessment, be upon the three years' average or the current year. Legislation is proposed which will place the assessment upon the current year. Of course, the 1s. reduction only applies to the standard of 6s.; so that individuals who pay income-tax on the lower scale will find that their decrease is 6d. in the pound—that is to say, 2s. 6d., instead of 3s.

Gas companies are now getting warmly concerned in the corporation tax. The period of their exemption, with other public utility concerns, is drawing to a close. There is no indication yet as to what their position will be when the subject is again reviewed. But strong protests against the levying of the tax in the case of public utility concerns have come from the chairs of several gas and electricity supply companies; and industry generally has appealed for its abolition. The exemption at any rate should be permanently continued for all public utility concerns, for they are all under Acts of Parliament or Orders, and are subject to many restrictions and obligations. Therefore the corporation tax would fall with greater severity upon them than upon private trading undertakings. Many arguments upon the subject have been set forth in a joint memorial by gas, water, electricity, and tramway interests, which has been forwarded to the Chancellor of the Exchequer. Especially heavily would the tax fall upon those gas undertakings that are under the sliding-scale or kindred enactments. The Chancellor of the Exchequer has not yet given any indication as to what is likely to happen; nor was there any sign in his budget speech as to the abandonment of the tax. There is disappointment generally in industry over this matter, as the tax is only another impediment to industrial and commercial progress. The tax this fiscal year is estimated to yield £19,750,000. However, there is genuine satisfaction that a start has been made in diminishing the grievous burden of taxation, though it is only 1s. off the appalling 6s. income tax.

Coke-Oven Gas Experiences at Middlesbrough.

THE question of the advisability of adopting coke-oven gas for town supply is one which must always be determined on the balance of local advantages. When one has read the paper that Mr. C. F. Blincoe, the Engineer and Manager of the Middlesbrough Corporation Gas-Works, read before the North of England Gas Managers' Association last Friday, it is seen that he leaves very little room for even qualifying the view that the weight of advantage—in the circumstances of the coke oven gas supply to Middlesbrough—is decidedly favourable to it; and that, despite stoppages, the Corporation Gas Committee have been fully justified in the course they took in entering into a contract with Sir B. Samuelson & Co. The justification is wholly economic in nature; and in this the gas consumers have shared immensely. There can be no denial of the economic and financial success when the fact is considered that, during almost the whole of the war period, gas was being sold in the borough at the flat rate of 2s. per 1000 c ft., and that gas of high calorific value. At this price (which is one that consumers in most other areas could only envy, and not enjoy) the consumers have had an unrestricted supply. Under these conditions, it is not surprising to learn that, in the short space of five years, the midsummer load has more than doubled, and the winter load is about 75 p.ct. greater. Since the supply of coke-oven gas commenced, upwards of 4200 million cubic feet have been utilized. This raises another economic consideration. The quantity of coke-oven gas has resulted, computation indicates, in a saving in coal transport and consumption of 380,000 tons. There we have

three solid economic advantages, and in them there can be discerned good sense not only on the part of the Corporation Gas Committee, but of the suppliers of the coke-oven gas; for unless the contract had been a fair one and, so far as humanly possible, faithfully observed, much of what is said in the paper could not have been written.

The Gas Committee of the Corporation did not enter into the contract without the most critical investigations. They searched the experiences of America, and they paid visits of inspection to the Continent; and, in the result, there was conviction that the adoption of coke-oven gas was so right (in the circumstances in which it was offered to them) that they entered into a contract for a term of ten years. They have had seven-and-a-half years' experience—a period embracing the worst of times in international and labour history; and yet neither the Gas Committee nor their Engineer would retrace their steps. Difficulties have come—difficulties of a serious order. There could be no greater trouble than the complete stoppage of a town gas supply from such a prolific source as those 46 coke-ovens at the Newport Iron-Works. And when Mr. Blincoe says that, "from a managerial standpoint, the scheme cannot be looked "upon as an unmixed blessing," he is stating something in very modest fashion that must have been a somewhat acutely anxious experience when the big coal strike caused a total cessation of supply. There had been three partial interruptions of the coke-oven gas supply. Two of these were easily met by the carburetted water-gas plant. During the coal strike in the autumn of 1920, part of the coal-gas plant was in operation; and this aiding the carburetted water-gas plant, the position was easier than before. But needless to say the severest test came during the great coal stoppage of last year. It shows how well Sir B. Samuelson & Co. worked to do their part, when Mr. Blincoe is able to report that there was a decrease of only one-tenth from the normal supply for eleven weeks, and complete failure for twenty-five days. In view of the fact that the strike lasted three months, twenty-five days only of cessation we must regard as a notable performance, and a recognition on the part of the coke-oven plant owners that duty must enlist every endeavour to fulfil their obligations. When the strike started, there were 2500 tons of coal at the gas-works. The coal-gas plant was set to work at the beginning of the strike sufficiently to produce the coke necessary to keep the carburetted water-gas plant at work to its utmost capacity, and the coal stock was not exhausted at the time the strike ended. Such an experience may never come again. We hope it will not; but it proves that, if coke-oven suppliers in the worst of circumstances will (or can) do their part, then the provision that a gas-works has to make for such an emergency is of an order that is not outside the pale of practicability, in view of the advantages at all other times, the monetary sum of which for the consumers is an ever-accruing one—always assuming Middlesbrough conditions, or if possible something even better.

The paper gives most of the details of the scheme and supply that are of general interest. It tells us of the plant and the work that had to be done to meet the changed circumstances; and it informs us of much else of technical interest. It does not mention the terms of the contract with Sir B. Samuelson & Co., nor whether any change has been effected in them since they were first entered into. The price charged to the consumers for gas at the present time is not stated. It is good quality coke-oven gas that is supplied—570 B.Th.U. But, whereas at one time the coke-oven supply was adequate for the area, it has now to be supplemented by production from the work's own coal-gas and water-gas plants—particularly in the winter time. In the paper the proportions of the different gases are not quoted, nor is the calorific value of the mixed gas. Where there is coke-oven gas supply to a town, there will always have to be stand-by plant at the gas-works, unless towns are (in the event of trouble in the coal-mining industry) to be deprived of the service of gas, which is unthinkable. A liberal measure of possible deficiency has therefore always to be made in estimating stand-by plant requirements. But invention has been providing a way to meet this position. It seems to us that—working under these conditions—nothing could be better than a complete gasification plant, and a stock of coal. Water-gas plant requires coke; and coke production a carbonizing plant. Seeing that, when coke-oven plant is the source, or the principal source, of a town supply, the gas distributors have no bye-products for sale, or only a small quantity, they do not want to have to find bye-product markets merely during an emergency. A unit of complete gasification plant could be always utilized, so as to have men available for it; and it is a type of plant that requires a small amount of labour. In submitting this, we are having regard to the special circumstances of the main—sometimes the whole—supply being from coke-oven plant. Some engineers may have a preference for meeting an emergency another way. Mr. Blincoe has. He appears to prefer a water-gas and coal-gas plant, the latter of which would provide the necessary coke for the former. This opinion he has come to—that, where coke-oven gas is utilized for town purposes, the most favourable condition for ensuring a continuity of supply exists where the town demand exceeds the surplus available from the ovens the whole year round. The gas-works plant can then be kept in operation to provide the difference; and any deficiency or interruption in the supply of coke-oven gas would then be more readily met, as immediate supplies of coke would be available for the stand-by water-gas plant. In other words, Mr. Blincoe from experience inclines to the view that it is better that the coke-oven gas should not be equal to the total district demand, but that there is greater protection in partially maintaining a gas plant in operation. Whichever is the safest way of working in conjunction with a coke-oven gas supply, this must be said, that Middlesbrough did well during the great coal strike—better, indeed, than many undertakings which have never had coke-oven gas, and so have never known the difficulties of a cessation of its supply.

Turbo-Boosters v. Gasholders.

An interesting little paper was that which Mr. J. Kelly, of Bridlington, read at the meeting of the North of England Gas Managers' Association. In the first place, Bridlington must be congratulated upon the continuous ascent in popularity which the paper indicates it enjoys, and the Gas Company upon the harvest of increased business which it is deriving from that condition of affairs. Augmentation of business brings in its train its problems; and the Board of the Company and their chief executive officer—the author of the paper—found themselves faced by such a problem at about the worst time that it could possibly have arisen. That was during the war, when structural materials were the subjects of permits, and the power to raise money was at the dispensation of the Treasury. Something at that time had to be done by the Company to keep their consumers supplied. In the hours of maximum consumption, the second of the two holders was on the point of exhaustion; and the growth of demand since shows that the Company, had something remedial not been done, would not have been able to meet their obligations. A new holder was then out of the question; and so a turbo-booster was adopted. We regard a booster to-day—with the higher pressures now required, the stipulation as to pressure of the Gas Regulation Act, and the conditions laid down by the Board of Trade when declared calorific value descends below a certain point—as an indispensable item in all properly equipped gas-works. In this case, however, the booster was required to put off the day when a new gasholder would have to be constructed; and it has functioned well in this respect. But, of course, the service of a booster as an auxiliary to storage has its limits, though apparently the limits have not yet been reached at Bridlington. This is seen by the statement that since the booster has been in use, and certain alterations made in one of the governors, for various reasons, both holders have been worked down to the last two or three sheets of the inner lifts. Whenever this has happened, the booster has maintained the pressure and supply quite as steadily and satisfactorily as though the holders had been full. And in another part of the paper it is stated that the booster has made it possible to defer for several years the erection of a larger holder; and "it is hoped that this will "carry the undertaking over until one can be erected at "a more reasonable price than has been possible of late." The total cost of the booster, including foundations, connections, and valves, amounted to £863 13s. The building in which the plant is housed necessitated an expenditure of £239 9s. An alteration required in a 12-in. governor cost £23 10s. This is a total of £1126 12s., which represents a large difference compared with the cost of a holder such as the Company would require. The Company at the time made a wise choice as to the way of meeting the difficulty. As a matter of fact, there was no alternative. Whatever happens, the booster will always prove itself a valuable ac-

quisition; but as a substitute for storage, there are limits to its capabilities. If there is a marked deficiency in storage, then with a booster there has to be the ability to make rapid changes in gas production. This means a good margin of stand-by manufacturing plant.

Tar Dehydration.

IT was a timely and practical paper that Mr. S. A. Wikner, of Newcastle-upon-Tyne, contributed to the proceedings of the meeting of the North of England Gas Managers' Association. It was on the subject of the preparation of tar for road work. It is not by any means a new topic; but time and experience teach us many things—show what practices to adopt, and what to reject. Road work is now getting into full swing, and so the demand for prepared tar will be an ascending quantity. There is no question—a few motor-car trips about the country assert this—that the roads are in urgent need of repair. We also saw in Parliament last week that the question was raised of the frightful havoc caused to our roads and highways by heavy and increasing motor traffic. But tar and pitch have proved themselves to be indispensable to the making or repair and maintenance of roads. It was, however, with tar preparation, and not the working-up of tar to pitch, with which Mr. Wikner mainly dealt in his contribution.

There is something in the nature of a warning in the early part of the paper; and it is that, unless the dehydrated material can be obtained at a reasonable price, the treatment of roads may be restricted on the score of expense. A "reasonable price" is all that should be desired. But what is a "reasonable price?" Circumstances for tar have altered; and therefore the gauge of a "reasonable price" has also changed. When experience demonstrates that tar effects savings in the maintenance of roads, having regard to the nature of the traffic there is now upon them, then the value of tar becomes enhanced. We realize, of course, what Mr. Wikner means. The price must be one which will not restrict, but have a tendency to increase, demand. One method of complying with this is to keep as low as possible the costs of preparing the tar; and a suggestion to this end is to eliminate all unnecessary handling and haulage by treating the tar at the seat of its production. We know that the number of gas-works practising tar dehydration is an increasing one, so that it is an acceptable and a paying practice. Of course, it is a ridiculous thing for tar required for road purposes to be transported from the district where it is to be used for treatment a distance away, and then be returned for application to the roads in the locality of its production. But that is what happens in several cases to-day. However, even dehydration introduces some amount of perplexity owing to the demand for the treated tar coming in the season of lowest production; and it is a costly thing to store for any length of time and to any large extent. In this connection, Mr. Wikner points out that complete distillation to pitch cannot usually be done to the best advantage except in large works. The cost of plant and supervision are drawbacks; the marketing of the products in many cases would be another disadvantage. Of course, this can be done by co-operation, as is the case in certain areas. But one cannot generalize much on what small works can do in this respect, seeing that the author himself admits that some moderate sized undertakings can show they are working-up to pitch quite successfully. Generally speaking, however, on small works, it is better not to venture beyond the first stage. Mr. Wikner therefore advocates as the correct procedure, given an assured demand for prepared tar during the season, the disposal of the winter surplus of tar to the large distiller, storing as much as possible, and dehydrating for the summer demand.

The author went on to discuss the different types of plant. He is a student of these matters, as was proved by his contribution to the discussion on the Society of British Gas Industries' paper at the last meeting of the Institution of Gas Engineers. He refers to centrifugal machines, and to pot stills. But he comes to continuous tar distillation as being the most suitable system; and, being the most suitable, it is the one usually adopted. As was shown by the Society of British Gas Industries' paper to which allusion has just been made, there are several types of plant—all with their own good points. As to heating, conservation of fuel is very important, and the method of heating may make a considerable difference in the working costs. Gas is something of a luxury in this connection. With it the operation is under better control, and labour is lessened. These are benefits of some value. But, admitting this, Mr. Wikner is strongly opposed to the use of gas for this purpose on account of its expense. It always depends on the nature of an operation whether one fuel is to be preferred to another. And in tar distillation it has to be conceded that the burning of coke breeze is more economical—so much so that the savings will far more than pay for the extra labour, cost of furnaces, and upkeep. In the process, supervision is an important matter, seeing that temperature is a controlling factor in relation to the constituent parts of the tar. For example, in working one has to watch very closely the percentage of water in the crude tar, as quite small fluctuations in the percentage of water will affect the still temperature, and so change the quality of the product. Thus, even with gas firing, careful observation is needed to obtain really good results.

The author is not by any means favourable to working to the specifications that have been issued by the Road Board. It is clear he thinks they are unnecessarily exacting, and prescriptions of this nature are costly to comply with. If further economy and a material satisfactory to purpose be secured, then of course it would be foolish to attempt to comply rigidly with the specifications. Practice and prescription, it would seem from his experience, are a little repugnant the one to the other; and particularly in these days when tars varying in constitution are produced by different carbonizing methods. So we have him completely denying the claim that by continuous plants, and by elimination of varying proportions of the light oils, tar of any desired specification can be obtained. All that can be expected is that tar of any consistency can be produced at will. Even with well-equipped plants, it is not easy to work to specification. At Newcastle, the practice is to distil nearly or quite to pitch, and mix back with the requisite anthracene oils and creosote from which most of the naphthalene has been removed. Complaints are extremely rare when this is the mode of procedure. The author finds that, in the preparation of tar for road treatment, any real advantage to be gained by complication of the specifications may be easily neutralized by the increased costs. Simplification is his aim throughout. From the evidence, it might in his opinion be concluded that, providing the origin of the tar is authentic, limiting the specific gravity, and percentage of water and consistency, should ensure at a lower cost a product in every way satisfactory for use on the roads.

Perhaps the chief feature of the paper comes at the end. Mr. Wikner calls attention to the use of steam for distilling water out of crude tar. There is no doubt that the heat efficiency of an ordinary, well-equipped steam-boiler is much higher than can be obtained in any of the well-known types of fire-heated tar-stills; and in this fact we have a good basis for the proposal presented by the author. An apparatus has been specially devised for the purpose of distilling by the heat of steam; and, on a fairly large scale plant, he has been able to obtain satisfactory results. Indeed, from what the author says, this is quite a good proposition. A description does not appear in the paper. A patent has been applied for, so that later on we shall hear more about it. The heat consumption is of a reasonable order—in fact, the breeze required for raising the steam is per ton of treated tar about the same as obtains in the best fire-heated tar-stills. With breeze at 10s. per ton, the fuel costs would amount to about 3d. per ton of tar treated; and there can be no adverse criticism of this. The plant has certain commendable advantages—flexibility, installation is cheap, and its erection rapid. Full testings have not yet been made. But capabilities are demonstrated by the fact that it has been possible to dehydrate, without any trouble, tar containing 15 p.ct. of water; and this must be admitted to be a bad tar. Analyses of tar prepared by steam distillation are given in comparison with the requirements of Nos. 1 and 2 specifications of the Road Board. The analyses further corroborate the efficiency of the process. Mr. Wikner does not suggest that the treatment would be applicable to all tars; but it would be to the majority of tars obtained from horizontal retorts and coke-ovens.

As said at the beginning of this article, the contribution is timely and useful. It presents several practical matters for consideration; and that is what one expects from a man who is not only a practitioner, but a student of the work upon which he is engaged. From what has been said in the previous paragraph, we may expect to hear more from him on this subject before long.

Delays in Final Settlement.

It took about four-and-a-half years to bring the war to a close. It looks as though it may take about the same time to effect the final settlement of the just European claims of the Imperial Continental Gas Association. The position of the outstanding matters was explained by the Chairman (Sir Charles Jessel, Bart.) at the meeting of the proprietors on Tuesday last week. The Association are large creditors in respect of the closing-up of their affairs in Germany; and there are considerable claims relating to the Antwerp and Brussels stations, which cannot be cleared up yet, as there is another class of claim which must take precedence of claims in the category of those of the Association. There are also claims in respect of Austria still unsettled. But there is good hopefulness in what the Chairman said that some day will see a final clearance of the slate. The proprietors know full well that their Chairman and the Board (now including Mr. R. W. Wilson, the late Secretary) have done, and are doing, their best in these matters; and they cannot do more. Too liberal acknowledgment cannot be made of the work that, both in this country and abroad, Mr. Wilson has done in endeavouring to establish the full claims of the Association and to effect a quicker settlement. With his usual generosity and frankness, Sir Charles made reference to these matters; and the proprietors realize how true and how well-deserved was all that he said. The Association will not get the full measure of their claims; there will be a void between the sum of the claims and that of the receipts. But this, as the proprietors know well, will not be due to any lack of effort. Reference to the monetary details and the expectations need not be made here; the report in this issue of the terse statement by the Chairman provides all information. In their "reduced circumstances" in the matter of business scope, the Association have settled down comfortably to work. The particulars given at the meeting show that during the past year there was a turn in the tide, and one may fairly anticipate that from now the flow will get greater year by year.

Therm Charges and Benefits.

There are some people (a question in the House of Commons last week is an illustration) who are anxious that charging on the therm basis shall not produce any advantage to gas undertakings. The stock and share holders in gas undertakings wish it would produce them additional income rather more rapidly than other circumstances will allow. There are really few dividends that are up to pre-war levels; and there are market values that are very much below, though par value is being marked by various stocks. The suspicious busybodies, however, need not worry themselves. Whatever happens, the sliding-scale and basic prices and basic dividends will prevent therm stock and share holders getting a penny more than the dividend to which they are entitled without the consumers also benefiting in proportions laid down by statutory enactment.

Gas-Poisoning Records.

One of the points in the conclusions of the Carbon Monoxide Committee, it will be remembered, was a suggestion that the department concerned should carefully watch the situation, so that if the freedom from limitation which was recommended is accompanied by unexpectedly unfavourable results, the attention of Parliament may, if necessary, be again directed to the matter. One member last week called to the notice of the House the frequent cases of gas poisoning recently; but he did not mention anything as to the causes, an analysis of which would be very instructive. The President of the Board of Trade made a statement which shows that the Department is "watching the situation." From what he says, it appears that they are now notified of all fatalities attributable to gas poisoning; and reports thereon are made by the Medical Officers of Health. Mr. Baldwin added that there has not been any marked change of late in the proportion of water gas supplied by gas undertakings. Therefore the composition of the gas is the same. The causes of the gas poisonings must be looked for elsewhere—principally among the frailties of human nature.

Gas Coal Markets.

The position in the gas-coal markets last week appeared to be one of marking-time. Demand and business generally are taking quite a leisurely course. There is a feeling of greater safety in respect of supplies, and therefore a disinclination to "book-up," until there is better certainty as to the future. The tendency at the moment is to give a little more attention to second-class qualities of gas coal; and these are being pushed into rather more prominence by the market reports. Gas coal buyers abroad are, in view of the cost of transport, showing a preference for the best classes, or those with "best class" names.

Coke-Oven Gas for Town Supply.

In previous columns allusion is made to a paper on the supply of coke-oven gas to Middlesbrough. In last week's "Journal" we reproduced the main parts of a paper by Mr. T. Nicholson, in which he recounted to the Northern Section of the Coke-Oven Managers' Association his experiences of upwards of a decade in the supply of gas for town purposes from the coke-ovens at Willington. A large part of the paper was taken up by that out-of-date practice of enriching gas by benzole to improve its luminosity. Mr. Nicholson realizes that under the new order of things this is unnecessary. The average calorific power of the gas supplied from his coke-ovens is from 476 to 479 B.Th.U.; and it contains 15·17 p.ct. of inerts. The analysis shows a very good composition of gas. He spoke of the Gas Regulation Act, and of the widely differing calorific grades of gas supplied by town undertakings. It is true that the calorific power per cubic foot does vary considerably; but the efficiency in use does not, provided the burners are properly regulated and the gas-injectors of ample capacity to pass the needed B.Th.U. Reference is made to 260 B.Th.U. gas, containing 55·4 p.ct. of inerts, which, while excellent for power purposes, would not, Mr. Nicholson said, incandesce a mantle. He put this down to a reduction of flame temperature by the heat-absorbing action of the inerts. He did not say whether the mantle was an upright or an inverted one. The volume of flame naturally with such a gas was not sufficient to fill a large mantle. But had a small inverted one been employed, the volume of flame would have been ample; and Mr. Nicholson, we venture to think, would not have found the reduction of flame temperature would have made any material difference to the efficiency in relation to the B.Th.U. expended. Another point he makes is that while coke-ovens may not be a method of carbonization attractive to the gas engineer for installation on the works, coke-oven gas must have attractions for the gas industry generally as an auxiliary supply, where it can be obtained on favourable terms. Of course, coke-ovens are to be found on gas-works in this country, and to a greater extent on the Continent. In large gas-works, there is no reason why coke-ovens should not form a unit of the plant, and why metallurgical coke should not at such works be available as well as ordinary gas coke. A review of the discussion on the paper is published this week.

Electricity Company Promotions.

Does anybody in the gas industry recognize one or two of these names: Lt.-Col. E. Eaton, C.E., Sir Charles B. H. Soame, Bart., and Mr. R. G. Harley? They are the Directors of the Chagford and Devon Electric Light Company, Limited, with the "Chagford" printed on the prospectus in rather smaller type than the "Devon." Some years ago the gas industry received considerable attention from promoters of companies of small dimensions with big names and capitals to correspond. Many of those companies later on got into the hands of receivers. Representatives of the electricity industry should investigate the present prospectus to ascertain what can be made of it. The electricity undertaking, it states, has been established for thirty years; and the issued and paid-up capital is £1174, out of £2000 of ordinary shares, of which it is stated 750 have been allotted as fully paid-up otherwise than for cash. Whether the 750 is included in the £1174 is not clear. However, the £2000 is the "authorized" amount of ordinary shares. Added to it is £5000 in "9" p.ct. cumulative preference shares; and "authorized (1922)" is a sum of £8000 of 7½ p.ct. first mortgage debentures—making the capital £15,000. Some £2925 outstanding debentures are to be discharged from the proceeds of this issue. The debentures, it is stated, are guaranteed for repayment on Jan. 1, 1930, at a premium of £10 p.ct.; and therefore they will yield £8 15s. p.ct. on redemption. There we have tempting baits—so much like those that were put forward in those old days of promotions of gas

companies with inflated capitals. All the 7½ p.ct. first mortgage debentures, and the whole of the cumulative preference shares are now offered to those who desire to invest in the electricity undertaking of Chagford, which was "one" of the earliest in the county of Devon to take advantage of water power for the generation of electricity. The whole prospectus is vague, rich in generalization, and very lean in those definite points (in fact their omission is striking) that are necessary to test the health of any concern.

Labour Topics.

Some of the clouds in the labour world are clearing away. There has been a settlement in the cotton industry, and now in the shipyard strike. In the latter instance, the men return to work with the 16s. 6d. reduction per week before them which was the subject of the strike. The only difference between what might have been without a strike and what is with a strike is in the dates at which the sums representing the 16s. 6d. are to be withdrawn. There is to be an immediate reduction of 10s. 6d. per week; a further 3s. from May 17; and 3s. from June 7. On these "revised" terms there was a ballot—against acceptance 46,306 votes were registered; for acceptance, 41,264. This indicates a distinct division of judgment, and not the necessary majority for continuing the strike. So it came to an inglorious end for the Unions, and, as it should do, on the side of right and common sense. Mr. W. A. Appleton, the Secretary of the General Federation of Trade Unions, in his quarterly report refers to the "utter exhaustion of trade union funds, and a decided reaction against trade unions." The condition of affairs is also having a serious effect upon membership. He urges reform, "because experience has shown the impracticability of many of the entrancing proposals with which the dilettante, the dreamer, and the revolutionary have sought to beguile the trade unionist." So sensibly speaks an old trade union leader.

The Engineering Lock-Out.

Members of 47 Unions were locked-out as from Wednesday morning last, in company with the members of the Amalgamated Engineering Union, who have now had several weeks holiday on Union money rations, which are remote from the amount of wages they might have been earning. The response to the employers' invitation to resume work on conditions which have been proved to be reasonable was of only a sporadic character; and loyalty to the Unions was much more apparent than discretion and the exercise of the men's free will. The leaders of the Unions were evidently alarmed over the invitation of the employers to the men. They published a protest against the employers making individual contracts, and spoke of this being an attempt to undermine the confidence of the men in their elected leaders, and to cripple, if not actually to destroy, the trade unions. This is all very weak, seeing that the attack on the managerial rights of those who had established works and businesses came from the Unions. The inquiry, by Sir William Mackenzie, into the causes and circumstances of the lock-out, was started during the week; and after the proceedings had got fairly on the road, Sir William tried to get the parties to re-open negotiations, to ascertain whether there was not room for compromise. The representatives again met, with the same abortive result. So the inquiry goes on; and nearly a million men remain idle. There are no signs yet of any recession by either side from the position taken-up over the managerial question.

Midland Association of Gas Engineers and Managers.—The spring general meeting of the Association will be held at Wolverhampton, on Thursday, the 25th inst.

Society of Chemical Industry.—The annual general meeting of the Society will be held in Glasgow, from July 4 to 11 inclusive, under the presidency of Dr. R. F. Ruttan. Prof. H. E. Armstrong, F.R.S., is to deliver the Messel Memorial Lecture; and on Thursday, July 6, in the Chemical Engineering Group, papers are to be read by Mr. P. Parrish on "Observations on the Design of Ammoniacal Liquor Stills," and by Mr. W. A. Walmsley on "Tar Distillation." A number of visits are on the provisional programme, including one on July 5 to the Provan Chemical Works of the Glasgow Corporation. A busy week has been mapped out; but the actual business of the meeting is confined to the three days July 4, 5, and 6. Dr. E. F. Armstrong, F.R.S., has been nominated to the office of President. Mr. E. V. Evans and Prof. Henry Louis have been re-elected Hon. Treasurer and Hon. Foreign Secretary respectively.

ELECTRICITY SUPPLY MEMORANDA.

It was seen in last week's "Memoranda" that a number of central station engineers had expressed their views on the question of hiring-out electric apparatus. They would all like to adopt the system; but the difficulties are many—especially initial costs and depreciation. The view was quite striking as to the opinions of those who, having had experience, had found the deterioration of electrical apparatus a burden and a troublesome matter—a factor, in fact, that could not be dismissed as being of no account. Those who yearn for domestic electrification, and the proceeds that would come from the load, if all were well, press forward their advocacy. Every little thing that is done in this way is heralded abroad with tremendous vigour. In Glasgow, 200 electric cookers were recently let out at a rental of £2 per annum. The announcement is now made with appropriate flourish that another 200 have been ordered. But what do these represent in such a population as that of Glasgow? Quite recently it was seen that there are 150,000 housewives in the city who cook food for their families either completely with or by the assistance of gas. An electric cooking enthusiast is Mr. W. A. Gillott; and he has been writing in the "Electrical Times." His sympathies are with the station engineer who is contemplating with mixed feelings his reduced industrial output by reason of slackness of trade, lock-outs, &c.; and he wants to help them in these conditions—present and future. Compensation for such circumstances, he says, lies at the very doors of the central station; but as we read on in the expectation that, from Mr. Gillott, we shall find something new, we are — well not exactly disappointed, but rather astonished to find that it is nothing better than domestic electrification, on which the electricity industry has been working with small encouragement for many long years. He reiterates that, with a well-planned campaign, the domestic load might be made to reach the proportions of a moderate industrial load. "Might be!" He admits there are difficulties. But he advises, "if you cannot jump over them, go round or under them so long as you get on the other side." This is not good philosophy. Difficulties that are jumped over, or round or under which one gets, still remain. The problem is how to get rid of the difficulties once and for all. Mr. Gillott knows as well as anybody that the difficulties are not easy of solution; but it should also be well known to him that it is no use leaving them there to be got over, round, or under every time, because that is not the way of rapid progress.

Domestic Electrification.

The Lure of the Cooking Load.

Mr. Gillott mentions some of the difficulties, but not all. He alludes to residential areas in which cables are laid for lighting, and which are of insufficient strength to take on any material load for other purposes. Of course, then there is no alternative to strengthening. He recommends the ordinary course that intelligence would take—a gradual extension. The additional revenue obtained from the extension will, if the undertaking is lucky, provide the money for further extensions. This is such an easy method of expanding the trading side of the electricity concern, that it is a marvel it has escaped notice so long. In Mr. Gillott's view, some engineers underestimate the capabilities of their cables. He has known of networks which it was thought had reached saturation point, but to which hundreds of kilowatts were added without strengthening the cables or meeting any trouble. The reason this is so, is that the cooking load has a high diversity. It may have in some areas, but not in all. A case of a village is cited in which over 200 6-KW. cookers are installed; and the maximum load on the feeders at any one time does not exceed 120 KW.—the demand occurring at a time when the central station is needing a load—midday. The illustration is unfortunate. It is a village, and not typical of many denser residential areas. In most residential districts, the heads and many members of families are away in town at business all day; and the chief meal is prepared in the evening when the family are all at home. In the winter this would be at the time of lighting peak load. In self-contained villages no doubt the chief meal of the day is prepared for midday; but this does not apply to many populous areas, as the gas undertakings know full well, from an experience much larger than Mr. Gillott's. And in those districts it would only be the class of people who do customarily dine late who would be able to afford electric-cookers and electrical operation generally. The diversity of local conditions is quite as great as, if not greater than, Mr. Gillott ascribes to the cooking business. The cooking load is not compelled by any law to fall into the period of the day when the electricity station can best afford to carry it. It is quite true that on Sundays the cooking load curve of an average gas-works is greater (say) between 11 and 1.30 than on any week-day. But how many electric stations would like to have to meet an equal load for such a short time, and to experience deep valleys in the curve at other times during Sundays? Mr. Gillott agrees that a similar condition cannot be expected in the electricity station; but he sees no reason why a start should not be made to bring about such a tendency. It will be as well to go gradually in order fully to grasp other tendencies before it is too late. Mr. Gillott asserts that it will not cost the householder more to cook

electrically than by his present methods—"providing, of course, the tariffs are designed to stimulate progress." Tariffs may be so designed that there will be progress in the stimulation of unprofitable business. Among other points, Mr. Gillott advises that, if a domestic load is rapidly required, hiring should be adopted; if it is desired that the rate of progress should be slower, then the hire-purchase system should be adopted; if still more moderate progress is wished for, then the policy should be confined to the selling of appliances. Electricity supply undertakings have to cut their garments according to their cloth. For families of four to six cookers can be obtained (Mr. Gillott says) at £9 to £12 each; so that rentals of 30s. to 40s. per annum would provide 10s. to 12s. per annum for maintenance, and return roughly 10 p.ct. on the outlay. There are several obstacles to progress, reference to which is omitted; or rather, the author has neglected to give their troublesome side any strong definition.

At Billingham.

It is wonderful what can be done with electricity if it is sold cheaply enough; but there is an economic line below which it cannot be supplied if there is to be profit in it. A great deal of advertisement is given by the electrical papers to the so-called "electric village" at Billingham, where the Newcastle-on-Tyne Electric Supply Company have erected 73 small houses for the employees at their power station. In the April number of "Garden Cities and Town Planning," a description is given of the houses the Electric Supply Company have erected; and a feature is the electrical equipment. Why such a fuss is made of this is not quite apparent, because similar conditions can only possibly prevail where the owners of such houses are also electricity suppliers. In these houses the apparatus is under the direct supervision of the electricity suppliers; the principal occupiers of the houses were themselves once described as electrical "experts;" and they are allowed to have current at (according to our calculation from the published figures) 0·618d. per unit. Of course, at such an over-all price and with such supervision, one can do more electrically than would be the case in ordinary circumstances. In the living-room of each house there is a coal fire, and behind it a boiler from which the domestic hot-water supply is taken. There is another fireplace in the bedroom above the living-room. The remainder of the heating and cooking arrangements are all electric. The rooms heated electrically have ventilators provided either in the ceilings or high up the walls. In the living-room, there is a wall plug for the use of electric kettle, electric iron, &c., or electric fire if the coal fire is not in use. The scullery is fitted with an electric cooker, having an oven measuring 20 in. by 30 in. by 15½ in., and controlled by a switch giving three heats. The hotplate is fitted with a three-heat boiling-plate, a three-heat boiling-pan and vegetable steamer, and a grill and hot cupboard. In the bathroom is an electrically heated clothes boiler, supplied with hot water by a tap from the domestic hot-water supply. "Only a small consumption of electricity is, therefore, required to boil up the water, and keep it boiling"—most of the heating-up having been done by the coal fire. In the bedrooms, portable electric fires are provided "of ample capacity to quickly heat the rooms, and when heated to maintain an even temperature on 'low-heat' regulation."

Consumption and Cost.

It is stated that in these houses, with their two coal fires, the average consumption of electricity is 3300 units per annum, at an annual cost to the occupants of approximately £8 10s.—the current being supplied through a shilling-in-the-slot meter. This only works-out to 0·618d. per unit. It is stated that in another part of the country a corporation have quoted a price per unit to their housing-scheme tenants which, on the above consumption, would work out at £11 18s. per annum. This again is only 0·865d. per unit. It seems to us that there is something of a preferential nature in these figures, to which other consumers in like circumstances might object. It will be noted that the figures include lighting. Yet we are told in the article before us that the rates "are estimated to yield a reasonable profit to the electricity supply undertaking." The houses at Billingham, which consume 3300 units per annum, are only five and six roomed ones. Supposing an average of 2d. per unit was charged for lighting and other purposes, the cost per annum would run-out to £27 10s. Of course, we shall be met with the reply that at Billingham the charge to the Company's employees is so low that they can make free use of the current. If they do not find in their five or six rooms that 3300 units are more than sufficient for comfort and convenience, then other people, to get below that consumption, would have to give up part of their comfort and convenience in order to be more economical, and even then have to pay stiffly for what they can get.

Scrap the Gas-Works!

There is a person, signing himself "Interested," who has written a letter to the "Perth Daily News" which is full of ignorance—real or assumed. It suggests that gas-works shall be scrapped. Probably it is a bit of finesse that induces this individual to write anonymously. He does not want his identity known—perhaps, too, he does not desire anyone other than the Editor to know that he can write such foolishness as there is in his letter, and which may (as it is deliberately intended to do) mislead some of the technically uninstructed readers of the paper. It appears that the "Perth Daily News" has been making a stand against the appropriation of "large" profits in aid of the rates from the electricity undertaking. Our contemporary has our fullest sympathy in that matter. It has also referred to an expenditure of £80,000 for the installation of a modern gas plant. "Interested" calls attention to this, and then tells two falsehoods. The Editor, fortunately for himself, is able to repudiate participation (other than in giving them circulation), seeing that at the head of the letter is published the announcement: "We do not hold ourselves responsible for the views expressed by correspondents." The first of the two falsehoods is that "during the last thirty years electricity has gradually ousted gas for all lighting purposes." That is untrue. The second is: "And more recently for all power purposes." That is also absolutely untrue. What is more, both statements will remain untrue. Then "Interested" goes on to say that "it would be simple to demonstrate that, providing electric cooking and heating were to-day approximately as economical as gas, it would be a fearful blunder to spend vast sums of money to perpetuate the dual service in Perth." If it is so simple, why on earth did not "Interested" complete his task with the demonstration, and so set at rest once and for all any doubts that the people of Perth may have upon the subject. It is not, however, easy to make the demonstration. What it is easy to demonstrate is that for most lighting purposes gas affords the best possible quality of light, and economically; that in power it is more economical, but that both gas and electrical energy have their places—the one through economy and reliability, and the other through convenience and for intermittent work for small powers—and that in heating and cooking, from the thermal and costs point of view, electricity cannot show the same excellent case as gas. We do not think that, with all "Interested's" pretence and misleading statements, he would care to get engaged in an open discussion, with disclosure of his name, on the subject of relative thermal efficiencies and costs. If he does, we (or others in the gas industry) will oblige him. If he does not, then his idiotic suggestion as to scrapping the gas-works must be treated with the contempt it deserves, and which contempt would only be intensified if he endeavoured to justify his wild assertions, to some of which we have called attention, and another of which will serve as a fitting conclusion to this notice of his senseless talk: "How will we stand if in three or four years it is found, as I verily believe, that the modern electric stove and water-heating services can be made locally, and prove cheaper in use than gas, in addition to their other well-known advantages?" He "believes" that, does he! Then we will not discuss the matter further with any anonymous person possessed of such ignorance, unless he reveals himself, and makes some attempt by data to justify what he says.

Those Wily Gas Companies.

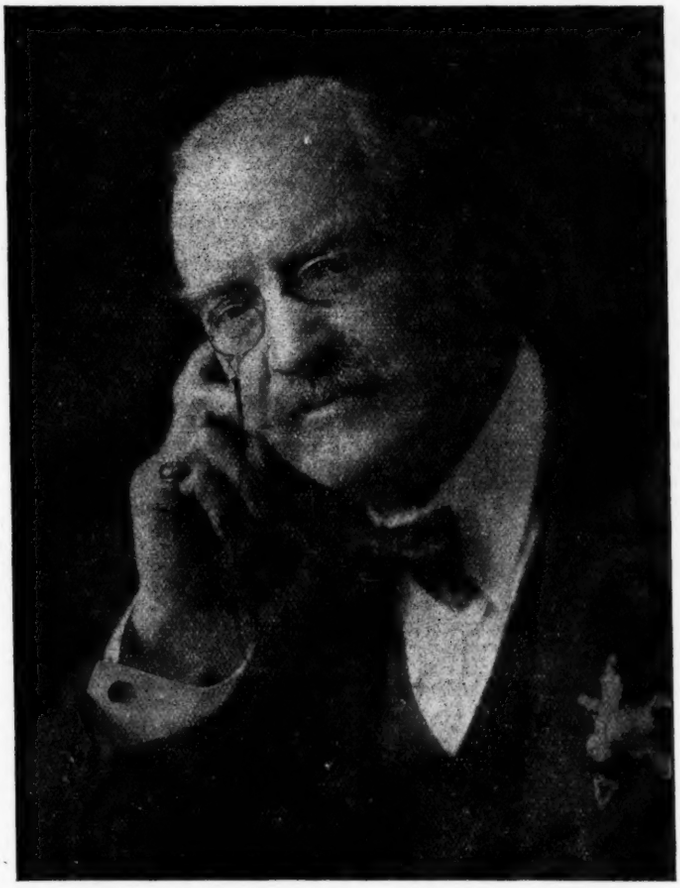
The "Electrical Times" and "Electrical Industries" are somewhat perturbed over what they obviously think are crafty moves on the part of the Gas Light and Coke Company. The papers have had their attention called to the matters in question by the report of the Parliamentary Committee of the London County Council which we noticed as far back as April 19 [p. 161]. The report dealt with the Special Order for which the Company are applying, and to which in the main the Committee could not take exception. But the electrical papers referred to think there is sufficient in the draft Order to warrant a sharp eye being kept on the Company by the electricity distributors in their area. The papers do not like the stand-by clause, which is common to modern gas and electricity legislation. They object to it because (so we gather) the Gas Company might employ it as a lever for compelling a householder to use all gas instead of part gas and part electricity. Is it not also feasible that electricity suppliers—in view of the pretensions of electricity to be able better and cheaper to do most things done by gas—might use their possession of a stand-by clause to induce a householder to use electricity for all lighting, cooking, room heating, and hot-water supply, instead of gas? However, it is too late in the day to oppose stand-by clauses; and the County Council advisers do not suggest this should be done. The Company are also seeking power to specify piping, which is an excellent thing in the interests of good service. Then there is a clause which the Parliamentary Committee of the County Council think should be opposed. It is to enable the Company to lay pipes through any part of any premises, in order to supply gas to some other part in different occupation. This is an essential brought about by modern housing development. The General Act compels the Company to supply any householder with gas upon application, so long as he complies with the statutory conditions. Supply being obligatory on the Company, they must have, under all conditions, reasonable facilities for giving it; otherwise the compulsion to supply must be abrogated. It is not the Company's fault that there has been in the mode of living such a large transformation from separate houses to flats. It is not likely that the Company would use this power unreasonably, though our electrical friends and the Parliamentary Committee of the County Council seem to entertain some notion that they would be quite capable of doing so.

Midland Junior Gas Association.—For to-morrow (Thursday) a visit has been arranged to the Summer Lane power station of the Birmingham Corporation; and on the 18th inst. there will be the annual meeting, at which the report will be submitted and new officers elected.

DEATH OF THE RT. HON. SIR DANIEL FORD GODDARD.

WITH profound regret we have to record the death on Saturday morning last of Sir Daniel Ford Goddard, Chairman of the Ipswich Gas Company, the Tottenham District, Light, Heat, and Power Company, and the South African Lighting Association, Ltd. He was also a Director of the Gas Light and Coke Company, and of the Bournemouth Gas and Water Company. Only last week we announced in the "JOURNAL" that Sir Daniel was suffering from heart trouble, and then we expressed the sincere hope that there would be a speedy recovery. This, however, was not to be.

Sir Daniel was one of those men whom we can ill afford to lose from the gas industry. He was a man of many parts—a friend of all with whom he came into contact; the buoyancy of his spirits and his genial disposition were magnetic; his kindness of heart made for him friends wherever he went. The great practical interest that he took in the affairs of the gas industry are well known—he having been trained as an engineer, and having had the duties of Engineer and Manager of the Ipswich Gas Company upon his shoulders. During that time he fashioned many things in its affairs which made for greater prosperity, and were foundations upon which his successors were able to build with certainty in the years which succeeded his passing from active official work in the gas industry into the political affairs and life of the nation. We will not expatiate further upon the personal attributes of Sir Daniel, excepting to say that his presence, his work, his fidelity, in connection with all the gas companies with the administration of which he was associated, will be sadly missed; and the people of Ipswich to-day account themselves the poorer by his passing from their midst over to the great majority. Among them he has lived and worked well; and the memory of it all will be a lasting one.



THE RT. HON. SIR DANIEL FORD GODDARD, J.P

It is convenient, in making a short reference to the life of Sir Daniel in connection with the gas industry, to mention that his grandfather, Mr. Daniel Poole Goddard, did much in laying the basis of prosperity of the Ipswich Gas Company. He was succeeded in office by his son, Mr. Ebenezer Goddard, who for forty years filled the dual position of Engineer and Secretary. To the position his son, (then) Mr. Daniel Ford Goddard, succeeded. Like his father, the last-named was trained as an engineer. He served his articles with Messrs. E. R. & F. Turner, of Ipswich, and afterwards pursued the study of chemistry as applied to coal and gas in London under Professor Heisch, and at Marecco's Analytical Laboratory, Newcastle-on-Tyne, in which latter city he also spent a profitable year in the office of Messrs. Monkhouse, Goddard, & Co., Public Accountants. Endowed with great commercial ability, he was eminently fitted to the gas-engineering profession; but after five years' full control of the engineering and managerial work of the Ipswich Gas Company (during which the business developed and prospered exceedingly), he resigned the position with the Company on March 31, 1887, with the intention of devoting himself to public and more particularly political work. In the engineership he was succeeded by Mr. John T. Jolliffe, formerly of Sunderland. Mr. Goddard, however, had no intention of entirely severing his connection with the Company. It would have been an unthinkable thing for the Company to be without a Goddard while there was a Goddard to be had. A vacancy had occurred on the Board through the death of one of the members; and he was elected to fill it—the directorate thereby securing the invaluable advantage of his judgment and intimate experience of the Company's affairs. In the year 1895, Mr. Goddard was elevated to the Vice-Chairmanship; and in 1901 he succeeded Mr. George Arthur Biddell, C.E., as Chairman of the Company, which position he held until the hour of his death. It will be seen from the foregoing that the association of the Goddard family with the official management and direction of the Company extended to three generations, and covered the long period of 96 years. If the time was included during which Sir Daniel's grandfather was identified as a subscribing shareholder and a member of Committee of Management of the Company, previous to his appointment as Engineer, the period would exceed 100 years—a remarkable and honourable record indeed, which is probably unique in the gas profession. We look back with interest and happy memories to the centenary celebration of the Company last year, when it was our privilege to be among the guests—mostly the Company's employees—at the beautiful residence "Oak Hill" of Sir Daniel and Lady Goddard. To-day our sympathies, as those of countless friends, are with her.

Mr. Goddard on his retirement from official service in connection with the Ipswich Company at once entered into political life, and was elected a Parliamentary representative for the Borough of Ipswich. He sat in the House of Commons for 23 years, and retired at the time of the General Election at the end of 1918. In the House he was not prominent as a speaker in the debates; but as a worker in its affairs his energy knew no abatement. The honour of Knighthood was conferred upon our friend in 1907 for services rendered to Parliament as Chairman of the Public Accounts Committee, and in recognition of social and religious work founded and carried on by him at the Ipswich social settlement. Just after the conferment of this honour, he was elected a Director of the Gas Light and Coke Company in place of the late Sir Hugh Owen. In Parliament, Sir Daniel rendered many services to the gas industry which were very valuable and much appreciated.

Prior to this he had been a Director of the Tottenham Company from the year 1897; and when Sir Corbet Woodall died, he succeeded his old and intimate friend in the chairmanship of that Company. One need not refer to Sir Daniel's association with the other Companies. Suffice it to say that in connection with them all he took the deepest detailed interest, and ever and again at the meetings of the various Companies his invaluable services were recognized by his colleagues and by the proprietors of the concerns. From all the Boards, his presence, his work, his urbanity, will be greatly missed. Reverting to his public work, it was not only political and philanthropic, but he did inestimable service for the Borough of Ipswich in connection with its municipal affairs—having served the town as Councillor, Alderman, and Mayor.

Before concluding, we ought perhaps to mention that he took a great interest in all the organized work of the gas industry; and his companies are, without exception, valuable supporters of anything that is done co-operatively to further the interests of the industry. He was one of the Vice-Presidents of the British Commercial Gas Association.

The burial takes place to-day; and the funeral service is, very appropriately, being held at the Ipswich Social Settlement at 2.15.

Progress of Applied Chemistry.—We have to acknowledge the receipt from the Society of Chemical Industry of Vol. VI. (1921) of "Reports of the Progress of Applied Chemistry." Its 600 pages include contributions on "Gas Destructive Distillation—Tar Products," by Dr. Geoffrey Weyman, F.I.C., Chief Chemist to the Newcastle-upon-Tyne and Gateshead Gas Company; "Acids, Alkalis, Salts, &c.," by Mr. P. Parrish, A.I.C., Manager of the South Metropolitan Gas Company's Chemical Works; and "Fuel," by Prof. J. S. S. Brame.

PERSONAL.

There was a pleasing little function at a recent meeting of the Board of the South Metropolitan Gas Company, when well deserved recognition was made of the great amount of work done by Mr. and Mrs. E. W. Gilbert, in connection with the Company's Employees' War Fund. This extensive and well-known fund was established on Aug. 5, 1914, and dissolved on July 10, 1920; and during the whole of these six years Mr. Gilbert worked hard as Hon. Secretary, and was assisted ably by his wife. To Mr. Gilbert was presented a massive silver rose-bowl, bearing an inscription, recording his six years' voluntary work on behalf of the fund, and to Mrs. Gilbert a gold wristlet-watch.

A six months' trip to Australia—made partly for business reasons, and partly for the benefit of his health—has just been completed by Mr. Max Falk (the Chairman of Messrs. Falk, Stadelmann, and Co., Ltd.); and to mark the occasion of his return a dinner was given last Saturday week, at Frascati's Restaurant, by the heads of departments and representatives of the firm—Mr. L. Thurner being in the chair. The toast of the guest of the evening was proposed by Mr. A. R. M'Clelland; and in reply Mr. Max Falk gave a brief sketch of his trip, and a description of conditions in Australia and New Zealand. Among other toasts was that of the firm's Colonial branches, proposed by Mr. Max Falk, with which was coupled the name of Mr. H. S. Potter, their South African representative, who is at present on a trip to this country.

The many friends of Mr. Edward Lane, of the Volker Lighting Corporation, will be pleased to learn that he is making a speedy recovery after his very severe operation, and hopes to resume his pleasant business relations in the very near future.

Prior to taking-up his post as Street Lighting Inspector under the Cardiff City Council, Mr. Frank Marsh, for nine years with Curran's Engineering and Foundry Company, Cardiff Docks, has been presented by the firm and employees with a gold watch.

Mr. S. O. Pacey, a native of Doncaster, has been appointed Works Manager of the Doncaster Corporation Gas-Works, under the general departmental control of Mr. R. Watson, the Council's Gas Engineer and General Manager. Mr. Pacey was articled to Mr. Watson in 1903 at Doncaster, and afterwards became the first Manager and Secretary of the Brodsworth Gas Company, whose works at Carcroft he erected in 1909. A year later he went to Turkey as Assistant Engineer to the Ottoman Gas Company, and in 1913 became Chief Engineer to the Gas Department of Pernambuco, South America. When war broke out, he returned to England, received a Commission in the East Lancashire Regiment, and in the course of the war served in the army, the navy, and the air force. On demobilization he went back to South America to take charge of the gas-works at Santos. It was in February, 1921, that he returned to Doncaster, and became Assistant Manager at the works of which he now takes control.

At a meeting of the Directors of the Newport (Mon.) Gas Company last Friday, Mr. William Stanford, who has been in the Company's service since 1886, and for the past 22 years has acted as Accountant and Chief Clerk, was unanimously appointed Secretary in succession to the late Mr. T. H. Hazell.

We learn that Mr. R. G. Shadbolt has removed his office from Central House, New Street, to No. 75, Trafalgar Road, Moseley, Birmingham.

OBITUARY.

WILLIAM ROBERT COOPER.

The loss has to be regretfully recorded of one of the best known members of the gas profession in the Midlands, and one who had friends everywhere, in the person of Mr. William Robert Cooper, who died suddenly at his residence in West Bar, Banbury, on Saturday evening, the 29th ult.—some few weeks after the completion of his 83rd year. He had had more than one serious illness, but had seemed to have practically recovered; and, as a matter of fact, on the afternoon of the day preceding his death he attended a meeting of the Directors of the Banbury Gas Company. On the Saturday morning he went for a walk; and there were then no indications of any break in his health. Early in the evening, however, he collapsed while sitting in his chair, and passed quietly away in a few minutes. His geniality and kindness of heart will long be remembered by those who had the privilege of knowing him, and especially by the members of the Midland Association of Gas Engineers and Managers, whose proceedings were so often brightened by his presence. Two years ago, during the presidency of Mr. James R. Duff, the Midland Association visited Banbury; and those who took part in the outing will not need to be reminded how much Mr. Cooper did towards making the day an enjoyable one—as he did also on the occasion of their previous visit in 1896, when he himself (at that time Manager of the Gas Company) was President.

Mr. Cooper was a native of Leamington, and was educated at Warwick School. When twenty years of age, he went to Banbury as a junior clerk with the Gas Company, of which he in course of time became Manager and Secretary. This position he held for the long period of 46 years—retiring at the beginning of 1905, when he was nominated for a seat on the Board, and his services were retained as Consulting Engineer. On the occasion of his retirement from the position of Manager, the esteem of the employees of the Company for him was manifested by the presentation of a writing-table. All his working life he devoted earnestly and faithfully to the best interests of the Company. As has already been mentioned, he had occupied the Presidential Chair of the Midland Association; and about 1900, he became Treasurer, on the death of Mr. Peter Simpson, of Rugby. He was also a member of the Institution of Gas Engineers, having joined the British Association of Gas Managers in 1864. Among a number of his public appointments was that of Alderman of the Banbury Town Council; and for many years he was Secretary and also Treasurer of the local Mechanics' Institute. He, however, steadfastly refused to accept the Mayoralty, to the great disappointment of the inhabitants. He was on the Commission of the Peace for the borough.

Mrs. Cooper pre-deceased her husband seven years ago; but two daughters survive, and with them general sympathy will be felt. The funeral was largely attended.

The death has occurred, at the age of 58 years, of Mr. Alfred Stobbart Welford, who had been Manager for 21 years to the Howden Gas Company, Ltd., and was formerly in the service of the Selby Gas Company. He leaves a widow and one son.

The Hastings and St. Leonards Gas Company have had the misfortune to lose their Deputy-Chairman, Major Stanley T Weston, J.P., who died last Sunday week, at the age of 79 years He was a well-known public man, and had been four times Mayor of Hastings. With the exception of Dr. G. G. Gray (the respected Chairman of the Gas Company), Major Weston was the Senior Magistrate on the Hastings Bench.

The death occurred on April 24, after about ten days' illness and at the age of 71, of Mr. A. Witham, who for many years represented Messrs. J. & W. B. Smith, Ltd., in the South and West. As will be known in these parts of the country, on account of failing sight he recently retired on a pension granted by the firm. The interment was in Old Southgate Cemetery, on the 28th ult. Mr. Witham is survived by a widow, a son, and a daughter.

NATURAL GAS AND OIL IN FRANCE.

It is not generally known that France possesses considerable national resources in hydrocarbons, for which she is still largely dependent on other countries. Spasmodic attention appears to have been given to the subject in that country during the last twenty years; but the economic and financial stringency engendered by the war has given fresh impetus to the development of this national asset. Our information is from an abstract in a recent number of the "Journal des Usines à Gaz."

Oil workings in America, Roumania, and Russia have shown that hydrocarbon occlusions lie in their natural order of density—first, gases, almost always under high compression; then petroleums; and finally salty water. Prospecting, moreover, is aided by direct indications—such as bituminous deposits near the surface, oozings of liquid hydrocarbons, or escapes of gas—or indirect evidence in the form of salt springs. After the war, the Ministry of Commerce realized the necessity of bringing before the public the existence of the above-mentioned considerable national wealth of petroleum and natural gas, and published a review of all the available information on the matter. This revealed oozings in the Hérault district; salty springs bringing-down petroleum at times in the Landes and Basses-Pyrénées; impregnated sands in the Upper Loire valley; natural gas in the Clermont-Ferrand district, in the Upper Doubs valley (of secondary importance), and at Vif (south of Grenoble), where a practically constant supply is available.

In 1906, at Vaux-en-Bugey (Ain), a salt-boring came across sand at 188 metres which showed traces of oil. A violent eruption of inflammable gas took place, which the engineers were unable to control, and which caught fire and demolished the whole working. In September, 1919, in the course of borings undertaken for the Government by the Society "Bonne Espérance," at 415 metres a serious explosion took place and a carbonaceous geyser was thrown to a great height. Recent drillings at Vaux have been grouped about the old working burnt-out in 1906; and the last has tapped, at 200 metres, an abundant source of combustible gas, which the undertakers have succeeded in confining. The pressure in the workings amounts to 15 kilogrammes, and the gas can be used for heating, lighting, or power production.

This success has encouraged the search for natural gas, and for the stratum of petroleum which in every case almost certainly exists near its source.

London and Southern District Junior Gas Association.—The annual general business meeting of the Association will be held at the Westminster Technical Institute on Friday evening of this week, when the new officers are to be elected; and a visit to the Fuel Research Station at East Greenwich has been arranged for Thursday afternoon, the 18th inst. A successful session will be brought to a close by a visit of members and ladies on Saturday, June 17, to the works and distributing stations of the Brighton and Hove General Gas Company. Luncheon will be provided by the Company; and a thoroughly enjoyable day is assured.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

ANNUAL MEETING IN NEWCASTLE-ON-TYNE.

The Annual Meeting of the North of England Gas Managers' Association was held at Newcastle on Friday last—Mr. F. C. WILLIS (the President) occupying the chair.

AN EXPRESSION OF THANKS.

The PRESIDENT, prior to the reading of the papers, said he wished to express, on behalf of the members, thanks to the Newcastle and Gateshead Gas Company for having housed the Hooper library, and for giving them permission to use the Company's splendid reference library.

NEW MEMBERS.

The following new members were elected: Members, Messrs. Thos. Law, of Malton, and C. H. Shapley, of Leeds. Associates, Messrs. F. Nicholls, B.Sc., W. Henderson, and W. C. Kimpster, of Newcastle.

OFFICE BEARERS.

The election of officers for the ensuing year, who take up duties as from the annual meeting, was announced as follows:

President: Mr. J. E. Blundell, of Carlisle.
Vice-President: Mr. J. Kelly, of Bridlington.
Committee: Messrs. W. Atley, of Stockton; W. L. Robertshaw, of Sunderland; and A. E. Ruffhead, of Darlington.
Hon. Secretary: Mr. N. S. Cox, of Sunderland (re-elected.)
Hon. Auditor: Mr. C. H. Armstrong.

TECHNICAL COMMUNICATIONS.

The Meeting then proceeded to hear and discuss the three papers reproduced below.

Mr. J. KELLY opened with

DISTRIBUTION PROBLEMS AT BRIDLINGTON.

At last year's spring meeting of this Association, two most interesting papers were read dealing with different methods of coping with one of the new problems set for the gas industry by the Gas Regulation Act, 1920. It may afford some relief, and perhaps not bore you too much, to turn away for a brief space on this occasion from the naturally more engrossing topics connected with possible future developments which may arise from the new regulations, to freedom with which that enactment has endowed gas undertakings, to glance at the more ordinary transaction of the solution of a small problem in gas distribution by a now well-known method.

The undertaking the writer has the honour to serve divides its area for distribution purposes into two districts, with separate reticulation systems—one controlled by a 12-in., the other by a 15 in.-governor. Two two-lift holders supply the area, both of which, in the year 1918, were connected by a common main to the inlets of the governors—as shown in fig. 1, in continuous lines. No. 1 holder had a capacity of 180,000 c.ft., and No. 2 364,000 c.ft. The total storage was therefore 544,000 c.ft. The pressure thrown by either holder was about 58-10ths when cupped and 30-10ths when uncupped. An initial pressure of about 60-10ths was necessary in order to supply an adequate volume of gas and to maintain sufficient pressure in one or two parts of each district. It follows therefore that the available storage really did not exceed 272,000 c.ft.

The average daily consumption early in August, 1918, was 612,000 c.ft.—see Table II. The maximum day's consumption was 642,300 c.ft., and the maximum hourly consumption, usually between noon and 1 p.m., was 98,400 c.ft. About 270,000 c.ft., or over 44 p.ct. of the daily make at this period, was consumed between 8 a.m. and 1 p.m. Frequently both the holders would be fairly full at about 6 a.m.; and by noon one would have uncupped, and the other would contain less than a sheet of gas in the outer lift. On several occasions the morning demand was so heavy that shortly after 1 o'clock the second holder was within two or three rivets of uncupping; the first having done so more than an hour earlier. A still further increase in the maximum hourly demand, as well as in the average daily consumption, of gas between the hours of 8 a.m. and 1 p.m. was confidently feared—if this expression be permissible—since the nation had discovered that the long-continued strain of the overwork caused by the necessities of those dolorous days had made some relaxation essential, and people had begun again to pay short visits to the seaside to recuperate.

THE TURBO-BOOSTER.

It was very evident that something must be done. Probably it would have been impossible at that epoch to obtain a permit for the erection of a new holder. Even if this could have been done, it would have been difficult to secure permission from the Treasury to raise the requisite capital. In addition to these impediments, there was the consideration that the extraordinary cost would have entailed a not negligible permanent increase in the price of gas to provide interest on the outlay. After consideration of alternatives, it was therefore decided to instal a turbo-booster on the inlet of the station governors that would be capable of passing

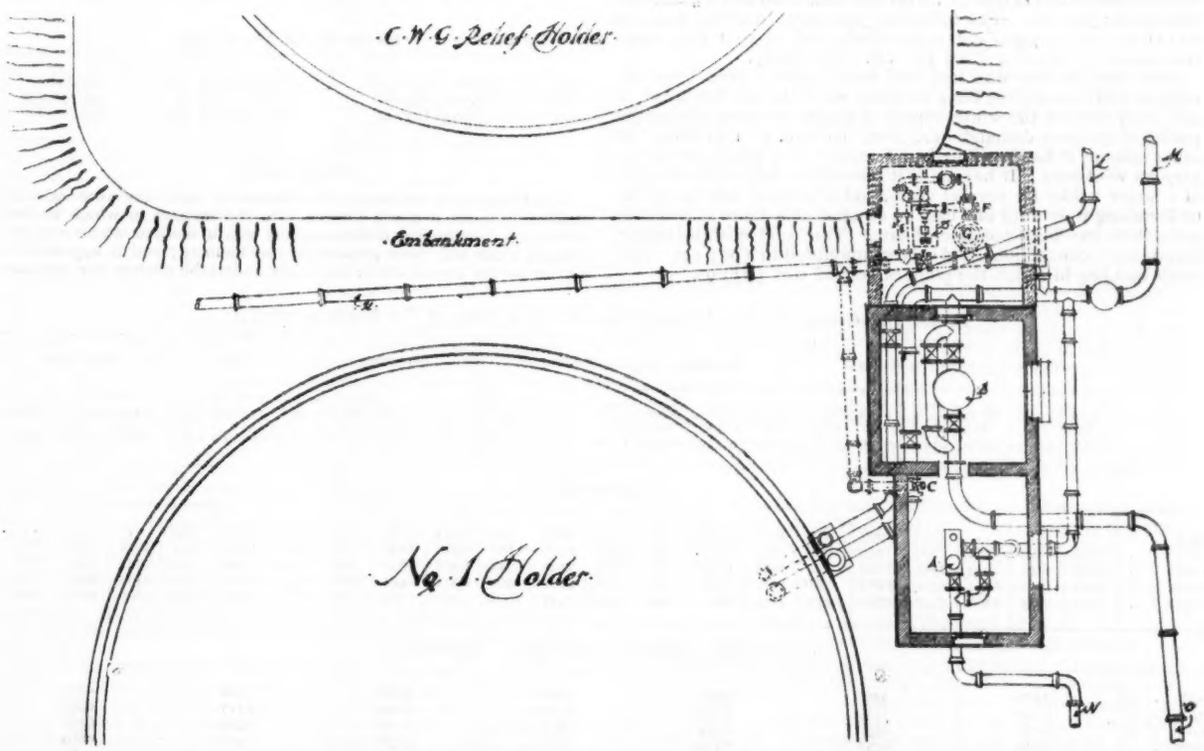


FIG. 1.—PLAN SHOWING ARRANGEMENT OF TURBO BOOSTING SET AT THE BRIDLINGTON GAS-WORKS.

A 12-in. governor; B 15-in. governor; C 12-in. valve on booster inlet main; D De Laval turbine direct coupled to Rateau fan; E booster inlet; F booster outlet; G pressure regulator on booster outlet main; H safety bye-pass, booster outlet to inlet with weighted pressure regulator; I 15-in. stop-valve; K outlet main (No. 2 holder); L inlet main (No. 1 holder); M works supply main; N main to old town; O main to Quay and Hilderthorpe.

150,000 c.ft. per hour at 4200 revolutions per minute against 12 in. pressure difference, and fitted with a 6-in. bye-pass between the outlet and the inlet controlled by a pressure regulator weighted to open when the pressure on the booster inlet should fall below 10-10ths, so as to prevent over-exhaustion of the holders (fig. 2).

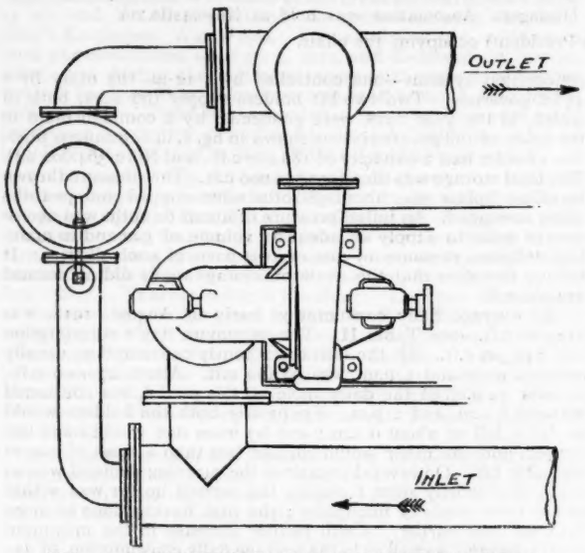


FIG. 2.—ARRANGEMENT OF DIAPHRAGM REGULATOR.

Pressure relief pipes, with regulators set to open at a pressure lower than that thrown by the seals on the governors, were fixed between the governors and the holder outlet pipes in order to release any pressure that might bank-up in the governors owing to leaky valves.

The booster was connected-up to the existing mains in the manner shown dotted in fig. 1. Its overload capacity would enable it to pass 280,000 c.ft. per hour with a pressure difference of 6 in. (the fan running at 4700 r.p.m.), or 250,000 c.ft. per hour with a pressure difference of 10 in.

Ordered on Nov. 4, 1918, the plant was delivered in May, 1919. The foundations were ready, and arrangements were made to connect-up by means of under-pressure drilling apparatus. The work of erection was carried out by the employees of the undertaking without any interruption to the supply of gas; and the set was started-up for the first time at about 11 a.m. on Thursday, Aug. 7, 1919. During that season the maximum hourly consumption increased to 114,900 c.ft., and the maximum day's consumption to 684,700 c.ft. The following year these maxima went up to 121,700 and 757,900 c.ft. respectively, and in 1921 they again increased to 139,000 and 801,500 c.ft. respectively.

Since the booster was installed, both holders have been uncupped daily during the busy seasons, when the set has been in use every day for the whole supply of gas to the town during the period of greatest demand—*i.e.*, from 10 a.m. to 1.30 p.m. At other seasons it has been used on Sundays, and whenever necessary on weekdays. It has made it possible to defer the erection of a larger holder for several years, and it is hoped will carry the undertaking over until one can be erected at a more reasonable price than has been possible of late. The total cost, including foundations, connections, and valves, amounted to £863 13s. The small building in which the plant is housed cost £239 9s.

The constricted site entailed the connection, by means of a short right-angled tee, of the diaphragm pressure regulator outlet to the governor inlet main. The turbulence set-up thereby interfered somewhat with the action of the original pressure regulator. This rendered hand loading and unloading necessary in order to maintain a constant pressure as the demand rose and fell, otherwise there was a variation of 4-10ths or 5-10ths. On this being reported to the makers, they at once sent a specialist to investigate; and in the result they voluntarily decided to manufacture and supply, without charge, a specially-designed regulator of slightly different type in lieu of the original one, though there would have been no objection to retaining the first. The new regulator is very satisfactory.

The seal on the 12-in. governor was about 7 in. and on the 15-in. governor 10 in. It was necessary, in order to meet the demand, to raise the pressure on the inlet of the governors to 80-10ths at times. For this reason the governors at first were bye-passed, and the town was supplied directly from the outlet of the pressure regulator. It was not considered advisable to work permanently in this way; so quotations were obtained for alteration of the governors in order to increase the seal to 18 in. The price asked was about £100 for altering the two. No date could be fixed for completion. The makers, who were employed on urgent war-work, also intimated their reluctance to undertake the job. It was thereupon decided to obtain from a local iron-founder the requisite castings for deepening the tank of the 12-in. governor and lengthening the pillar carrying the balance arm; and, by the kindness of Mr. Nelson, who had a longer bell constructed in his workshops at the East Hull Gas-Works, it became possible to effect the alteration of this governor at a total cost of £23 10s. The writer is glad here to take the opportunity to make grateful acknowledgment of assistance of similar nature given by Mr. Nelson on other occasions also.

After the alteration was made, the governors were again brought into use; the pressure at the outlet of the regulator being maintained a few tenths higher than that at the outlet of the governors. Occasionally, for various reasons, both holders have been worked down to the last two or three sheets of the inner lifts. Whenever this has been done, the booster has maintained the pressure and supply quite as steadily and satisfactorily as though the holders had been full.

The appended tables have a self-evident bearing on the subject, and may be interesting for the purpose of comparison with other undertakings' daytime consumption.

TABLE I.

Year.	Maximum Hourly Consumption Recorded.	Maximum Daily Consumption Recorded.	Year's Make Uncorrected.
1916	68,000 (Aug. 16)	453,600 (Aug. 15)	122,573,800
1917	79,900 (Aug. 10)	583,000 (Aug. 8)	148,796,000
1918	98,400 (Aug. 4)	642,300 (Aug. 7)	166,404,500
	Booster started Aug. 7, 1919.		
1919	114,900 (Aug. 19)	684,700 (Aug. 27)	186,652,200
1920	121,700 (Aug. 8)	757,900 (Aug. 3)	198,750,000
1921	139,000 (Aug. 21)	801,500 (Aug. 23)	216,331,600

DISCUSSION.

The PRESIDENT, in opening the discussion, said they were indebted to Mr. Kelly for a paper dealing with the manner in which he had overcome distribution difficulties. It was a method which was becoming more and more popular in this country; and it appeared to him to be the logical course for every undertaking when the pressure

TABLE II.—*Giving Details of Consumption during a Week in the Month of August.*

Year.	Sunday.			Monday.			Tuesday.			Wednesday.			Thursday.			Friday.			Saturday.		
	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m.	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m.	8 a.m. to 1 p.m	1 p.m. to 5 p.m.	Noon to 1 p.m.	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m.	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m.	8 a.m. to 1 p.m.	1 p.m. to 5 p.m.	Noon to 1 p.m.
	Hundreds.																				
1917	..	..	..	1840	1097	616	2037	1289	660	1957	1271	720	2043	1186	704	2077	1121	695	..	..	..
1918	3706	949	984	2299	1210	658	2617	1097	706	2431	1460	668	2726	1446	711	2248	1412	631	2028	1384	687
1919	3226	1254	1033	2935	1169	732	2933	1636	762	3079	1438	924	2990	1331	890	2839	1390	745	2341	1361	762
1920	3638	1154	1154	2771	1169	781	2981	1510	952	3006	1606	903	2941	1444	1078	2932	1344	973	2438	1405	835
1921	3840	1273	1298	3340	1382	957	3174	1602	1038	3601	1437	1208	3200	1474	1100	2982	1681	1036	2689	1641	937

	Consumption, Midnight to Midnight. (Hundreds.)					
1917	5400	5290	5527	5597	5688	5301	5424
1918	6127	5419	6308	6423	6290	6217	6053
1919	6098	6357	6454	6557	6717	6466	6567
1920	6943	6752	7579	7268	7458	7400	6879
1921	6959	7661	7859	7614	7492	7593	7362

Average Daily Consumption during above Week. (Hundreds.)

1917 . . . . 546·2 = 100·4 p.c. of storage
1918 . . . . 611·9 = 112·4 ,, ,,
1919 . . . . 645·9 = 118·7 p.c. of storage
1920 . . . . 718·2 = 132·0 ,, ,,
1921 . . . . 750·5 = 137·9 p.c. of storage

became a problem. Speaking from memory, he thought it was thirteen years ago that the undertaking with which he was connected had brought into use a system of this kind; and after that length of time, he could assure them from their experience that Mr. Kelly did the right thing. It so happened that he was himself living on the pipe-line about five miles from the works; and he really did not know how they could have delivered the gas as needed at such a distance if they depended simply upon holder pressures to-day. There were times when they worked up to a pressure higher (he believed) than Mr. Kelly's—something like 15 in.—on Sundays between twelve and one. He rather thought that if the pressure-raising plant were to fail at such a time, someone would be in trouble over Sunday's dinner. He was glad to say such a thing had not occurred. They had duplicate plant. If there was one thing he might suggest to Mr. Kelly as an improvement to the plant at Bridlington, it would be the putting-down of another set. Of course, there was little wear and tear on the plant; but the day might come when the ball bearings needed attention, and it would certainly relieve the difficulties if he had another plant to bring into operation. It was really remarkable to see by the figures what a great amount of gas was going from the works at Bridlington for cooking purposes. Comparing it with his own undertaking, they made yearly about three times the amount Bridlington did, yet Mr. Kelly had to send out more than half the quantity of gas they sent out as a maximum between twelve and one o'clock. He thought Tynemouth had a good cooking load, but it was obviously far behind Bridlington. The pressure-raising plant at Tynemouth was electrically-driven, and might to-day be looked upon as a rather expensive installation by comparison with steam. They had been largely governed by the fact that no steam was available at the time it was adopted; but if steam were available, he would have no hesitation in following the method adopted by Mr. Kelly and use steam. He would like to ask Mr. Kelly what was the approximate distance he was sending out the gas, and what pressure he endeavoured to maintain at the inlet of the meters. Generally, in their own case, they were able to maintain an average of 4 in. at any time of the day. It would appear from Mr. Kelly's figures that the maximum daily output occurred towards the end of the summer. This was an unusual position. For their part, while they had a good summer load, they still looked upon the winter period as the heaviest of the year. Was the booster used for the mid-day load only, or was it also used for the breakfast and lighting load? It was unfortunate the site was so limited, or he might have been able to eliminate some of the bends. It was a marvellous thing to his mind that they obtained such a large output between twelve and one through a plant of such a size; and he would be interested to know what size the mains were. He took it they would not be less than 15 in. round the holder. At first sight one would have thought it impossible to get delivered the quantity of gas mentioned; but it had been done, and that was the proof.

Mr. S. SHADBOLT (Southbank) mentioned they had been up against similar difficulties, and had successfully overcome them by applying the booster method. Regarding the relief arrangements, they took no such precautions. They fitted the electrically-driven fan on the 6-in. main, and considered that the main gas outlet when normal constituted a bye-pass. They had inserted a butterfly type of valve, which, when the booster was stopped, automatically put on the full capacity of the ordinary main without hesitation. In their case they waited until all the governors were converted before putting in the booster. The whole installation was put in a year ago at a cost of about £500; and it was very effective.

Mr. A. C. HOVEY (Sheffield) thought the author was to be congratulated on the way in which, by means of the booster, he had dealt with practically the whole of the gas he made. They were very common now in many works, and greatly facilitated giving a good supply of gas to a wide area. Regarding gasholder space capacity, Mr. Kelly had shown with how little it was possible to manage. Then there was the regular quality of the gas that could be supplied hour by hour; and it was possible to do with less holder accommodation than previously. This was a feature which was becoming more generally recognized. It certainly seemed more businesslike than having a large capital outlay remaining for many portions of its life in a dormant condition. Mr. Kelly's arrangement was almost unique in the Provinces.

Mr. C. DRU DRURY (Sunderland) remarked that all of them, excepting those with ample storage, experienced difficulties in maintaining pressure in their holders. The only difference between them and Mr. Kelly was that the trouble arose in the winter, whereas his was in the summer months. He presumably would have to take his holidays in December. It was obvious the author had adopted the most reasonable attitude he could to meet his unique position.

Mr. F. P. TARRATT (Newcastle) said it might be interesting to know that at Newcastle the question of the booster was considered and adopted many years ago (in Mr. Doig Gibb's time), and there were then eight governors all supplied by the twin boosters, electrically-driven. Since then Mr. Hardie had put in two governors, and there were ten practically supplying the Newcastle district. They had the booster at certain hours of the day at midwinter, and also during the whole of the evening hours. At St. Anthony's, where they had a large holder, they boosted through by means of a gas-engine, which drove boosters put in during the war. They were now faced with a difficulty at Redheugh, where five holders of varying capacity and pressure had to supply Gateshead, and also send gas to Newcastle. They would have to put in a booster plant to supply gas to all those governors. They did find certain hours of the day a difficult matter, especially during the cooking period, and at lighting-up time for three or four hours.

Mr. D. CURRIE (South Shields) had been interested in the paper because at South Shields they were in the same difficulty some years ago. Before the outbreak of war, the undertaking had purchased a site to erect a large gasholder. They were in such a position with their holder capacity that they had little more than a million feet for maintaining the pressure. In 1919 they considered the best thing to do—whether to proceed with the holder, or get out of the difficulty some other way until such time as they could get a holder at a reasonable figure. The South Shields and Jarrow works were connected with a 16-in. pumping main running as near the railway as possible, being the lowest level in the district. It was decided to adopt the boosting system. Without the water-gas plant they could not maintain the requisite pressure for more than four hours, so they were in an awkward position; and they saw that even with the water-gas plant the pressure often dropped very low. However, since introducing the boosters they had overcome the difficulty. The pressure at which they worked them was 9 in., and 9 in. was available in the pumping main to Jarrow. They had district governors from there, and they could supply gas at Boldon four miles away at 3½ in. as against 2·15 in. formerly. One great advantage of maintaining a constant pressure with the booster plant was that the time could be chosen when to spend money on a holder. This was important. If they had had to get a gasholder in 1919, it would have cost many thousands of pounds for one of the best. He could endorse everything that had been said by Mr. Kelly regarding the advantages of having the booster. He thought its convenience and possibilities should be made as widely known as possible.

Mr. KELLY, replying to the discussion, thanked them for the way in which the paper had been received, and said he felt that more had been learned from the discussion than from his communication. He appreciated the advice of the Chairman regarding a duplicate plant. With their restricted space, it would be awkward to put one in that place; and besides, they still had the question of another holder to consider. It was a matter bound to arise. The load factor was now practically 80 p.ct. Their slackest time was really between April and June, and it was very short. It was true that their percentage of cooker users was very high. He accounted for it largely by the fact that it was a residential town, many of the houses being of the boarding-house type, with heavy cooking. Regarding the distance carried, he did not think the maximum would exceed two miles in any direction. The booster was not used only for midday, but at any time required, often for the breakfast load. Ordinarily the pressure sent out when boosting was 8 in., but they had gone up to 9 in. They boosted on the district and not a trunk main, and then governed-down. They aimed at maintaining 5 in. on the outlet. They had considered the question of a butterfly type of valve, but turned it down, believing it would tend to decrease efficiency. In dealing with the lighting load they were in a different position to-day than formerly, when it was an advantage with the flat-flame burner to have a low pressure. He was of the opinion now that the higher the pressure (within reason), the better the efficiency at cookers, heaters, and incandescent burners. All their apparatus was regulated for that by the makers, and it was necessary in their case to maintain the pressure to get efficiency. Replying to a question by Mr. Currie, he said they used the booster at any time, and paid no attention to whether the holder was cupped or uncupped. They could work-down to practically the last rivet. Certainly they could maintain a constant pressure so long as it worked.

Mr. S. A. WIKNER then presented a paper on

THE PREPARATION OF ROAD TAR IN GAS-WORKS.

In submitting this paper to the members of the Association, I have in mind that there have been during the past year or so many papers and communications to the Technical Press dealing with the distillation of tar for use on roads. I have endeavoured to avoid going unnecessarily over old ground, with the result that the paper may be thought rather incomplete. I trust, however, it will prove of interest and some use to the members.

We are now at the commencement of the period when road treatment can most advantageously be undertaken. There is no doubt that the roads of this country are for the most part in urgent need of repair. Moreover, the opportunity for employing labour on such useful work is one that will not be lost sight of when the phrase "Work instead of Doles" ceases to be merely a "slogan" and passes into practice.

In view of these facts it is anticipated that very large quantities of prepared tar will be required during this and succeeding summers. Unless, however, the material can be obtained at a reasonable price, the treatment of roads may be restricted on the score of expense. Any economy, therefore, in the cost of production of prepared tar is to be welcomed; and one of the first to suggest itself is the elimination of unnecessary handling and haulage, by preparing the tar at the place at which it is produced. It appears to be quite fair that the ordinary profit on the manufacture should remain in the district in which the tar is produced and used. That this is realized is proved by the increasing number of gas-works taking up the dehydration of tar for road use. It is to be remembered that in probably every case only a portion of the yearly production of tar at gas-works can be disposed of as road tar.

Treatment of roads is only possible during the summer, when the production of tar is at its lowest; and it is obviously not practical to store the large quantities made during the winter. Surplus tar must, therefore, be either sold to the distiller or worked to pitch at the gas-works. Here I would say that, in my opinion, complete distillation to pitch cannot usually be done to the best advantage except in large works. The cost of plant and supervision are necessarily higher than in the case of dehydration; but the greatest disadvantage arises in the marketing of the products. The sale of prepared tar is usually confined to local requirements, comparing indeed with the sale of the gas. It is quite a different matter, however, with the other products, all of which may have to be disposed of in competition with other producers at some distance. Such a state of affairs may be a happy one for the buyer (who is frequently the foreigner); but it is conceivable that it may not be in the best interest of the gas industry and the gas consumer, to say nothing of the tar distiller. It is known that some comparatively small undertakings are successfully working

their own tar to pitch; but speaking generally, it is more rational to work-up the tar at large centres.

It would appear then that, given an assured demand for prepared tar during the season, the more promising scheme would be to dispose of the winter surplus of tar to the large distiller, storing as much as possible, and to dehydrate for the summer demand. Some of the largest works in the country, particularly those owned by municipalities, work on these lines.

Choice of Plant for Dehydration.

Now with regard to choice of plant for dehydration. Dehydration without distillation can be effected quite successfully by the use of centrifugal machines of special type. The tar is heated to reduce its viscosity, thereby facilitating separation of the water, and is then fed into the swiftly revolving machine. Centrifugal force being many times greater than that of gravity, causes the heavier tar to separate from the water, both being taken off continuously at different points.

By this method quite a good quality of road tar is obtained from horizontal retort tar; but no light oils are recovered, and it is, of course, impossible to guarantee the production of tar to any particular specification. The running costs are probably high; but one of the main disadvantages is that there is a tendency to deposit some of the heavier particles of free carbon on the walls of the machine, and frequent stoppages are necessary to remove this. The deposit may amount to 5 p.ct. of the weight of the tar, and is a dirty product difficult to handle and dispose of even by burning. It is probably to be counted as lost, whereas if it remained in the prepared tar it would not be harmful, and indeed might be beneficial. Dehydration by distillation is the more usual method. The ordinary "pot" still is rarely installed for simple dehydration. For a given output it is expensive, and requires a fairly large ground space. Frothing of the tar during distillation is sometimes troublesome, and the risk of fire is greater when a large bulk is being heated. Continuous distillation is more suitable, and has rapidly come into use during the last few years.

The standard types of plant are now well-known, and have been fully described in recent papers on the subject. Members are referred to the brochure submitted by the Society of British Gas Industries at the Institution of Gas Engineers meeting last October [see "Journal," Vol. CLVI., p. 231]; also to the paper on "Tar Distillation" by Mr. E. V. Chambers, read before the Society of Chemical Industry in Newcastle on Jan. 25 this year [see "Journal" for Feb. 8, p. 322].

Each type of plant has good points, and many installations are performing excellent work in all parts of the country. All these plants are directly heated by fire, and require more or less constant attention to yield a uniform quality of product. The working is more under control, and labour is lessened by heating by gas. I am convinced, however, that in works where a surplus of coke breeze is available, it must be more economical to use breeze instead of gas. To illustrate this, over 2000 c.ft. of town gas per ton of tar is required for the complete distillation of pitch, whereas with similar stills the same duty can be done by the consumption of about 1½ cwt. of breeze. The difference in cost is very considerable, and the saving accomplished by using the solid fuel will far more than pay for the extra labour entailed, cost of furnaces, and upkeep.

The working is controlled by temperature, having first found by experiment the still temperature necessary to produce the required quality of product. Owing to the high latent heat of vaporization of water compared with that of tar oils, quite small fluctuations in percentage of water in the crude tar will affect the still temperature, and so change the quality of the product. Thus, even with gas-firing, close attention is needed to obtain good results. The distillate is collected in one fraction, which, after separation of the water, consists of a mixture of crude naphtha with the lower-boiling portion of the light oil.

Difficulty of Conforming to Specifications.

It is claimed that continuous plants, by the elimination of varying proportion of the light oils, can produce tar to any desired specification. This claim cannot be substantiated. All that can be expected is that tar of any desired consistency can be produced at will.

The preparation of tars conforming in all respects to (say) the Road Board Specifications Nos. 1 and 2 is, however, a very different matter. Even in well-equipped tar-works it is by no means easy at all times to work to such specifications. It is usually expedient to distil nearly (or entirely) to pitch, and mix back with the requisite mixture of anthracene oils and creosote from which most of the naphthalene has been removed. This method is invariably adopted at the St. Anthony's works; and it must be said that complaints of quality are extremely rare. Only by such methods can absolute conformity with these specifications be obtained. There are coal tars—*e.g.*, vertical retort tars—from which by no amount of juggling can tar to Road Board specifications be obtained. In these cases it is necessary to mix with more suitable tars.

The quality of tar made by the simpler process, then, depends entirely upon the class of crude tar used; and it is highly probable that a large proportion of the quantity thus made would fail in one or more respects to pass the Road Board specifications. In spite of this, such tars appear to have given every satisfaction in use.

A specification for tar for road use issued by a large county council whose requirements are stated to be up to 100 tons per week reads as follows:

> "The tar shall be refined coal tar, free from water, and shall be entirely obtained by the distillation of crude coal tar so as to remove by distillation the water, ammonia, and any light hydrocarbon oils which distil-over during the removal of the water. The specific gravity shall be as nearly as possible 1·190, and in any case not above 1·200 at 60° Fahr."

Such a specification, while ensuring the supply of a satisfactory tar, cannot be said to be exacting.

While appreciating fully the advantages of the growing tendency towards standardization of commodities, I suggest that it is possible, in the case of tar for road treatment, that real advantage to be gained by complication of the specifications may easily be more than neutralized by the increased cost of manufacture. From the evidence it might be concluded that, provided the origin of the tar is authentic, limiting the specific gravity, percentage of water, and consistency should ensure the supply at a lower cost of a product in every way satisfactory for use on the roads.

Having produced a satisfactory tar, the subsequent handling of the product is simple, and calls for little comment. Delivery is usually made in casks, in which case labour costs may be appreciably lessened by filling on an elevated platform or deck, from which the casks may be rolled direct to carts or railway trucks. Casks are usually returnable, and adequate provision must be made for the cost of maintenance. They may lie for weeks on the roadside in the hot sun, and are subject to much rough usage.

All the methods of dehydration referred to call for a not inconsiderable capital expenditure for plant, particularly when furnaces and smoke-stack have to be provided. Further, operating costs are high for the comparatively small quantities handled, especially in the case of continuous distillation, which must be kept going night and day.

Use of Steam for Dehydration.

I now wish to introduce to your notice another method of preparing tar for road treatment which, although to some extent limited in application, appears to have several features worthy of consideration. It is remarkable that little attention has been directed to the use of steam for distilling the water out of crude tar. The use of steam for this purpose is not unknown, but seems to have been very little practised. It is probable that the heat efficiency of an ordinarily well-equipped steam-boiler plant is much higher than can be obtained in any of the known types of fire-heated tar-still. If, therefore, steam can be applied to tar dehydration without any serious loss of heat units, the fuel consumption should compare favourably with that obtained in fire-heated plants. The ease of transmission of heat by steam, the simplicity of control, and other factors to which I shall refer later, make steam distillation quite an attractive proposition. After some experimental work on a fairly large scale, an apparatus was devised which gave satisfactory results. As the arrangement possesses novel features, letters patent have been applied for.

[There was given at the meeting a description of the arrangement with exhibition of drawings.]

It is of interest to consider the theory of the absorption of heat in the dehydration of tar. Assuming that dry tar has a specific heat of 0·5, and that 100 lbs. of crude tar contains 5 lbs. of water and 1·5 lbs. of crude naphtha, which will pass over with the water on distillation—then the heat required is:

1.—To warm up from (say) 62° to 212° Fahr.			
95 lbs. of tar requiring 75 B.Th.U. per lb.	=	7125	B.Th.U.
5 lbs. of water ,, 150 B.Th.U. ,,	=	750	,,
Total		7875	,,
2.—To distil the water and crude naphtha.			
5 lbs. of water requiring 965 B.Th.U. per lb.	=	4825	B.Th.U.
1·5 lbs. of crude naphtha requiring 160 B.Th.U. per lb.	=	240	,,
Total		5065	,,

If the distilled vapours are condensed and part with all their heat to the tar, the amount of heat theoretically required for both operations will then be 7875 B.Th.U., not taking into account any recovery of heat from the hot dehydrated tar, nor from the hot condensed distillates. This amount of heat will be provided by the condensation of about 8 lbs. of steam at a pressure of 80 to 100 lbs. per sq. in. This is equivalent to about 180 lbs. of steam per ton of tar; and taking the conservative figure for evaporation at the steam-boilers of 6 lbs. of water per pound of fuel (breeze), we get 30 lbs. of breeze required per ton of tar dehydrated. On the large scale the steam consumption has been measured by noting the amount of condensed water passing from the steam coil. Under conditions not the most favourable, it was found that under 40 lbs. of breeze was needed per ton of tar. This is at least as good as can be obtained in the best fire-heated tar-stills. The fuel cost, with breeze at 10s. per ton, amounts to about 3d. per ton of tar treated.

A feature of the plant is its great flexibility. The throughput can be varied up to the maximum, and the percentage of water in the crude tar can vary within wide limits without affecting the quality of the manufactured product. What happens is that, up to the maximum capacity of the plant, if the water is there the steam will remove it. Any reduction in the amount of distillation required simply means that less steam becomes condensed. The plant is thus automatic in action, and attendance costs are at the minimum. The plant can be cheaply and

quickly erected; there being no brickwork beyond the foundations. Starting-up occupies only a few minutes; and when the plant is in regular use, it can be left gently steaming overnight ready for an immediate start next morning. Such a plant can be worked on extremely simple lines.

At the start of the day's work, barrel filling commences, and is continued throughout the day at a prescribed maximum speed. The experimental plant at St. Anthonys has a capacity of 4 tons per hour or more. Working an eight-hour day, up to 30 tons per day can be produced; the labour cost being only the cost of the barrel filling, which must be incurred in any case. The cost of steam raising is to be considered. Dehydration being required only in the summer, there should be no shortage of steam. For the production of 30 tons per day, the fuel to be consumed at the boilers would be about 15 cwt. In many cases, in view of the summer load on the boilers, no extra cost of boilerman's wages would be incurred. At the worst, the tar plant would not be debited with more than (say) one-fifth of the cost of a shift in wages and maintenance of boiler plant. Such an arrangement should compare very favourably with tar plants which need to be worked continuously day and night. The heating, taking place near the surface of the tar, removes the risk of frothing.

It has not yet been convenient to test the limit, if any, of the percentage of water in tar which can be successfully removed by this plant. It has been found possible to dehydrate without trouble tar containing 15 p.ct. of water, which must be admitted to be a bad tar. Naturally it is an advantage to eliminate as much water as possible by settling before the tar reaches the still. In the distillation of tar by this means, there is usually obtained per ton of tar some 3 gallons of crude naphtha of excellent quality. This is generally readily saleable, and produces an appreciable addition to the revenue. The plant is constructed of steel or wrought iron, and is subjected to very little corrosion. Steel plates and tubes under similar conditions have been found in good order after 15 years of continued use. Much, however, depends on the exclusion of air. The final condensing coil and outlet for distillates should be of cast iron.

ANALYSIS.

Now with regard to the quality of the product. We have seen that coal tar from horizontal retorts, particularly that from North Country coals, after being dehydrated by mechanical separation, forms an excellent material for road purposes. Such a crude tar, after steam distillation, would produce an even better product, and would, moreover, comply in every respect with the county council specification, to which reference has been made. Here are given the analyses of two samples, "A" and "B," of tar prepared by steam distillation on the large scale, with (for comparison) the limits allowed in the Road Board Specifications Nos. 1 and 2.

—	No. 1 Road Tar.	No. 2 Road Tar.	Sample "A."	Sample "B."
Specific Gravity . . .	1·16 to 1·22	1·19 to 1·24	1·180	1·185
Water, p.ct.	maximum 1·0	..	0·5	0·5
Ammonia, grains per gal.	maximum 5	..	3 grns.	3 grns.
Distillate to 170° C. (deduct water), p.ct. . .	maximum 1·0	maximum 1·0 including water	0·5	0·6
Distillate 170° to 270° C. p.ct.	16 to 26	12 to 18	20·6	14·6
Distillate 270° to 300° C. p.ct.	3 to 10	6 to 10	4·5	7·0
Distillate 170° to 300° C. p.ct.	24 to 34	21 to 26	25·1	21·6
Tar acids in distillate between 170° and 270° C. p.ct.	maximum 3	maximum 2·0	2·0	2·0
Free carbon, p.ct. . .	12 to 21	12 to 22	12·0	14·0

Samples "A" and "B" were prepared from tar from horizontal retorts produced in this district. Sample "A" conforms in every respect to specification No. 1. Curiously enough, sample "B" is too heavy for the No. 1 quality, and is, in fact, within the limits of distillation of specification No. 2. No simple dehydration would produce No. 1 quality tar from sample "B," which really requires thinning-down with creosote.

It is freely admitted that the steam dehydrating plant will not in its present stage produce the heavier qualities of prepared tar called for by some specifications. Sufficient has been said, however, to indicate that within the limit of quality referred to, the distillation of tar by steam in suitable apparatus affords a cheap, convenient, and safe means of producing prepared tar suitable for the ordinary tarring of roads. Such treatment should be applicable to the majority of coal tars obtained in horizontal retorts and in coke-ovens in this country. It should be particularly successful in the case of such tars produced from coals available in the district covered by this Association.

DISCUSSION.

The PRESIDENT said it was questionable whether civil engineers were faced with a greater problem to-day than road maintenance and formation. It was hardly within the province of the Association to discuss this aspect of the subject; but he might say there was plenty of evidence about that the problem had not been solved. Whatever products of the gas industry might be used in solving the problem of road construction and maintenance, it was up to them to provide the best possible, whether treated or dehydrated or refined. Mr. Wikner had not only brought forward a paper, but had put before them definite proposals which ought to have far-reaching effects in regard to the preparation of dehydrated tar. He could speak with some knowledge regarding the mechanical plant. Many years ago they introduced a plant at Tynemouth which was of the centrifugal type. It was installed chiefly with a view to getting out of the serious difficulty they were in regarding ammoniacal liquor or water in the crude tar. It was now about twelve years since the machinery was introduced; and it had worked more or less continuously ever since, and had undoubtedly met the position in so far as keeping control over the liquor was concerned. As Mr. Wikner had suggested, such a plant had distinct limitations. There was the formation of soft pitch in the vessel, which was practically unmarketable; and no doubt in the plant which Mr. Wikner had put forward this was practically overcome. The author had given an estimate of the loss on mechanical plants as high as 5 p.ct. In their case, it was much less than this. At the same time he did not wish it to be understood that he was advocating mechanical plants against the apparatus described. There was not the slightest doubt of its having great advantages. Mr. Wikner had not told them much about running costs; but he gathered from his remarks that it must be very low indeed. He had the pleasure of seeing the plant at work; and he could assure them that it appeared to be simplicity itself. The plant seemed to be working without trouble and practically no attention. Of course, a great deal rested upon the tar in the first instance. A mechanical plant depending upon density was of little use where one got light tar, such as some water-gas tar. The figures in the table, showing a reduction of the water down to 0·5, were very good indeed. Of course, there were many points of view as to what sort of tar would be best for road purposes; and Mr. Wikner realized this when he referred to the specifications. He questioned whether any tar would equal certain specifications which were insisted upon. There was not much doubt in his mind that, given a good heavy tar, such as was produced from horizontal retorts fairly consistently, an appliance of the type described should be very successful in producing a good quality tar for road purposes.

Mr. W. W. ATLEY (Stockton) said that, after having inspected the plant, he felt sure it would be a useful adjunct to those already in the country. One thing which struck him was that the apparatus would obviate the danger of frothing. The plant was so simple that one wondered why it had not been discovered before. There was a great future before it. The only point for anyone thinking of going in for it was to make sure he had a sufficiently regular supply of crude tar to warrant its working. At Stockton, they had a very good continuous plant, and had no trouble with it at all. Still, had the plant described been known two years ago, it would have had their favourable consideration. The one trouble they had had was frothing. The makers suggested the alteration of the overflow pipe on the three superheaters; but in doing this, they stopped the frothing at the expense of efficiency. He would like to know if any sizes had been got out, or any information that would give different gas-works an approximation of what its cost would be.

Mr. S. SHADBOLT (Southbank) said it appeared to him the plant would meet a unique want. A thing which had struck him when negotiating the bumps on our roads was the large number of small gas-works sprinkled all over the country which must not be supplying the quantity and quality of tar required; and as the plant appeared to him to be of a type capable of accommodating its size to even the smallest works, there was a future for it and the undertakings which utilized it. They had a Tully plant in which they carbonized nothing but coal; and in the scrubber pit at the foot of the plant they got a tar which was almost unique. It had a tremendous moisture content, and a viscosity almost a record. In a little experimental tank they made a tar macadam which was the envy of the urban district council; and from his small experience with this plant he was sure there was a great opening for the country gas-works to meet the demands of the road surveyors.

Dr. G. WEYMAN said the plant appeared to be most effective. He did not quite understand Mr. Wikner's figures, because he almost seemed to get something out of nothing. There appeared to be no expenditure of heat beyond the warming-up, and that was because he got the whole of the heat of the products in cooling vapours back to the tar. Mr. Wikner would agree that the efficiency was not likely to be 100 p.ct.; and probably he covered the point in his fuel efficiency of under 40 lbs. of breeze per ton of tar. In any case, it was an extraordinarily good efficiency, because tar and oil were difficult to heat-up.

The CHAIRMAN: Can you say approximately what temperature you get in the dehydrating zone at the surface of the tar?

Mr. WIKNER: About 105° C. as a rule.

Mr. A. C. HOVEY (Sheffield) said that those who saw Mr. Wikner's works would scarcely recognize in them what they had come to regard as the appearance of a tar-works. Mr. Wikner had worked in troublous times in developing the works, which were initiated by Mr. Hardie, and had made a great success of them. Referring to the author's remarks that vertical tar could not be juggled for use for roads, he would remind them that it was apparently necessary to use it to bring up to proof the ordinary horizontal tars for that purpose. He had recently visited a works in Scotland where there was vertical retort tar; and for the last ten years there had been a good demand for it. He did not say it met the specification for road tar. At Blyth, vertical retort tar was made and sent 100 miles away, securing a price that Mr. Wikner would not present to a customer in that district. It commanded such a high figure because of its good qualities when mixed with other tars.

Mr. WIKNER thanked the members for the reception of his paper, and for the flattering remarks from those who had actually seen the plant in operation. He had been interested to hear the President say that he did not get 5 p.ct. of carbon deposit in his mechanical plant; but this was the figure given him by one using such a plant. Possibly this was exceptionally high; but in any case it was a nuisance, as it stopped operations. Mr. Atley had rightly condemned frothing as a terrible business; and it had caused more sleepless nights to tar distillers than anything else. There were some plants in which frothing had been prevented; but the types which were not under pressure

were always liable to froth with watery tar. He was bound to admit that his plant as it stood was subject to serious limitations—it would not take out certain light oils; but, as had already been suggested, it would do such a large portion of the work that it would leave very little to be done by a small gas-fired plant of known type. Being able to do at least two-thirds of the work, it would be very economical in conjunction with another heating unit. He did not agree with Mr. Atley when he suggested that it was no use adopting that speeding-up method unless they had a large volume of tar to distil. Mr. Wikner went on to suggest that, no matter what the amount was, there was bound to be economy in getting through the job in one day if it now took even only two. The man employed for two days now could be released for other work for a day. No particular sizes of plant had yet been gone into—as a matter of fact, they did not yet know the limit of the plant described, as they had not reached finality by any means. The plant described was large; but it would deal with 100 tons per day. No costs had been worked out as yet. They had not reached that far, but in due course they would be got out. As to Mr. Shadbolt's remarks on the potential supplies from small works, it was with such small works in mind that the work was entered upon. Regarding Mr. Hovey's remarks, he did not mean to suggest that vertical tar could not be used for road purposes, but that it could not be juggled into specifications. In his opinion, it would be as good as any other for road purposes; but when they were up against specifications, what could they do? He did not know of any vertical tar going out alone and answering specifications.

The third paper was by Mr. C. F. Blincoe, the subject presented being

NOTES ON THE USE OF COKE-OVEN GAS FOR TOWN SUPPLY AT MIDDLESBROUGH.

The utilization of coke-oven gas for town purposes was first brought to the notice of the Middlesbrough Gas Committee in 1903. At that time the gas-works plant had just been reconstructed and extended, and circumstances generally did not favour a change in the system then existing.

In 1913, when Messrs. Sir B. Samuelson & Co. were about to make extensive alterations and additions to their coking plant at the Newport Iron-Works, they again brought-up the subject for consideration. Careful inquiries were instituted regarding experiences with coke-oven gas in American cities. Visits of inspection were also made to several Continental towns which were wholly dependent on coke-oven gas for public purposes, and which in some cases drew their supplies from collieries 20 to 30 miles distant. The information obtained was sufficient to convince the Gas Committee that the proposition was a practical one; and they decided to enter into a contract with the firm mentioned for a supply of crude coke-oven gas over a period of ten years. It was agreed to take as much of the gas as the town demand would allow up to 1,600,000 c.ft. daily, which was the estimated maximum quantity available. Subsequently this quantity was increased to 2,000,000 c.ft. daily.

Arrangements for Dealing with the Coke-Oven Gas.

The installation of the system involved:

(*a*) The laying of a main for conveyance of the gas from the Newport Iron-Works to the gas-works—a distance of about 2 miles. A 20-in. diameter S. & S. cast-iron main with run-lead joints was decided upon for the purpose.

(*b*) The partitioning of the gas-works plant so that a separate element from the exhauster to the outlet of the station meter could be set apart for coke-oven gas, and another element reserved for coal gas or carburetted water gas when it became necessary to bring in either of these as an auxiliary to the main supply. Fortunately, in the reconstruction of the gas-works, my predecessor (Mr. D. Terrace) had gone a considerable way in dividing the plant so that the gas from each of the two retort-houses could be separately treated up to the outlet of the station meters; and, therefore, very slight alterations were needed to achieve the desired object.

(*c*) The reconstruction of our carburetted water-gas plant to make it capable of producing up to two million cubic feet daily. This plant was to act as a stand-by, to be brought into operation at short notice should there be a partial or total failure of supply from the coke-ovens.

The cost of these alterations, &c., was approximately £10,000.

Description of the Coke-Oven Plant.

A description of the coke-oven plant from which the gas is drawn is interesting, as showing the variations from gas-works practice. The battery consists of 46 ovens of the Otto regenerative type. Each oven has a capacity of about 9½ tons of coal; and the carbonizing period is from 28 to 30 hours. There are two hydraulic mains. Into one is passed the rich or "fat" gas selected for town use during the first ten or fourteen hours after charging the ovens, the period varying according to the quality desired. The other main receives the lean gas evolved during the later stage of the carbonizing period which, after treatment for recovering residuals, is used for heating the battery.

The town gas passes from its hydraulic main through tar-spray towers to the saturator. In the tar-spray towers the gas is subjected to showers of tar and liquor sprayed at high pressure to extract all tar contents. Up to this point, the temperature of the gas is kept above dew-point, so as to take up as much aqueous vapour as possible. Thence it passes into the saturator, where ammonia is extracted by the direct-recovery process. From the saturator the town gas is conducted through surface and water-spray coolers to the exhauster, then through a rotary washer charged with benzolized creosote oil to remove the naphthalene, and into the 20-in. diameter main which carries it below the public streets to the gas-works. Here the gas is picked-up by the exhauster, and, after treatment by a set of four overhead purifiers (each 40 ft. square and charged with oxide of iron), passes through the station meters to the holder station for storage and distribution. There are three complete sets of tar-sprays and saturators—one for treating the rich (or town) gas, one for the lean (or oven heating) gas, and the third is reserved as a stand-by in case of breakdown, &c., in either of the other two sets.

Quality and Regularity of Supply.

The inauguration of the scheme took place on Oct. 15, 1914, when the first supply of coke-oven gas was received at the gas-works. The quantity was gradually increased till, by the end of March, 1915, the whole of the town's requirements were being met from this source, and the gas-making plant at the gas-works was laid idle.

The gas supplied was of good quality, regularly sustained; and practically no alterations or adjustments were needed to the existing burners and appliances. The following shows approximately the average composition of the gas supplied when the ovens are working under normal conditions:

	P.Ct. by Volume.
$CO_2 + H_2S$	4·0
O_2	0·2
C_nH_m	3·8
CO	6·0
CH_4	31·0
H_2	43·0
N_2	12·0
Calorific value	570 B.Th.U. (gross)
Illuminating power	14 candles by No. 2 Argand
Specific gravity	0·47

The crude gas as received contains from 80 to 100 grains of sulphur per 100 c.ft. During the first winter, difficulty was experienced with purification owing to the low temperature of the gas; but this was overcome by installing a range of closed steam-pipes (4 in. diameter) inside each purifier box, so as to raise the temperature of the gas to about 60° Fahr.

There has been an entire absence of naphthalene stoppages in both the gas-works and the distribution systems, although, about two years ago, owing to a breakdown in the cooling plant at the coke-ovens, a large quantity of this material was deposited in the crude-gas main soon after leaving the iron-works.

In the winter of 1916, the rapidly increasing consumption of gas exceeded the quantity available from the coke-ovens, and it became necessary to augment the supply with water gas. With each succeeding winter the quantity of water gas was increased; and in the 1920-21 winter season the coal-gas plant was again brought into commission, and has been in operation ever since.

Meeting Interruptions and Stoppage.

Since the scheme commenced, just over seven years ago, there have been three partial interruptions and one total cessation of supply from the coke-ovens. On the first occasion, the carburetted water-gas plant met the deficiency due to an accident at the ovens which restricted the output of gas for two days (May 24 and 25, 1916). The second occasion was brought about by the national railway strike in September, 1919, when the deficiency amounted to about 50 p.ct. over a period of about two weeks, which was again made good by carburetted water gas. In October, 1920, a coal strike occurred which again partially interrupted the supply of coke-oven gas for nearly three weeks. On this occasion the situation was easier to meet, as the coal-gas plant was in operation, and ample supplies of coke were available for the carburetted water-gas plant. The great coal strike of 1921 was the cause of the last interruption of supply, which was reduced to one tenth of the normal over the first eleven weeks, and failed altogether for 25 days. At the outbreak of the strike, the working of the coal-gas plant was restricted so as to produce coke sufficient only to keep the carburetted water-gas plant working to its utmost capacity; and by thus reducing the consumption of coal to the minimum, the stock of 2500 tons was not exhausted when the strike ended.

From the foregoing, it is obvious that the working of a coke-oven plant is more prone to be interrupted by labour and economic distubances than a gas-works plant. Therefore, where coke-oven gas is in use, it is necessary to have a stand-by plant of ample capacity to make good any possible deficiency up to a total cessation of supply, and capable of being brought into full gas-making operation at short notice.

It appears to the writer that where coke-oven gas is utilized for town purposes, the most favourable condition for ensuring a continuity of supply exists where the town demand exceeds the surplus available from the ovens the whole year round. The gas-works plant can then be kept in operation to provide the difference, and any deficiency or interruption in the supply of coke-oven gas would be more readily met, as immediate supplies of coke would be available for the stand-by water-gas plant, and the men engaged on the coal-gas plant would form a trained nucleus round which a larger staff could be rapidly formed to deal with any emergency that might arise.

The Financial Side of the Scheme.

Any doubt as to the financial and economical success of the scheme should be dispelled by the fact that during almost the

whole of the war period gas was sold in Middlesbrough at a flat rate of 2s. per 1000 c.ft. The consumers also had the advantage of an unrestricted supply, as, the gas being a waste product, no rationing scheme was imposed. These favourable circumstances, and the scarcity of coal supply for household purposes, created a rapidly increasing demand for gas, and, consequently, during the past five years the midsummer load has more than doubled, and the winter load is about 75 p.ct. greater.

Over 4200 million c.ft. of coke-oven gas has been utilized since the supply commenced; and it may thus be reasonably computed that a direct saving in the transport and consumption of over 380,000 tons of coal has been effected. To this extent, at least, the scheme has assisted in conserving the national fuel resources.

MANAGEMENT.

From a managerial standpoint the scheme cannot be looked upon as an unmixed blessing. An impression is apt to be created in the lay mind that almost all the cares and responsibilities of management disappear where gas is taken in bulk from an outside source, and that the task of maintaining a supply of gas to the community resolves itself into the simple duty of "turning a tap." To the experienced mind it needs little reflection to realize that much forethought, preparation, and resourcefulness are requisite, together with the wholehearted and loyal co-operation of a competent staff, to cope successfully with the emergencies which are likely to arise with such a system.

The adoption and ultimate success of this scheme is in a great measure due to the courage and financial acumen of Alderman Joseph Calvert, J.P., the Chairman of the Middlesbrough Gas Committee, whose permission to read this paper is here gratefully acknowledged.

DISCUSSION.

The PRESIDENT regretted that it would not be possible in the time at their disposal to give Mr. Blincoe's paper the discussion it deserved. He would like to congratulate the author and (through him) his Chairman and Committee for their courage in tackling such a big job and seeing it through. Reading between the lines, he thought Mr. Blincoe suggested that taking a dual supply was not without difficulties. The question of divided responsibility and dual management was bound to make the problem an anxious one from the point of view of the gas undertaking. Mr. Blincoe had not referred to the system of receiving from the coke-ovens, which were two miles from the works. He took it there would be some delivery fan or turbo-exhauster to deliver the gas to the exhauster. What were the pressure conditions at the inlet of the exhauster? Looking through the table of quality of gas, they were bound to admit that under normal conditions they got a very fine rich gas from the coke-oven supply. He had been struck by the moderate sulphur content of the crude gas. His experience was, unfortunately, that he was not getting gas of such low sulphur as Mr. Blincoe. It was a most desirable state of affairs, and was likely to ease the purifying plant to a great extent. The service was inaugurated at a difficult time; and they were to be congratulated upon having so few troubles. They might have been much worse off considering they were dependent upon outside supplies. To have to fall back at short notice upon the water-gas plant for a town like Middlesbrough must have (to say the least) placed a serious burden upon the management in maintaining a reasonable gas. He gathered, however, that in future coal gas would be available more or less continuously; and it would not then be a case of switching-off from coke-oven gas to water gas entirely. The mere fact that Middlesbrough consumers had been enjoying such a low figure as 2s. per 1000 c.ft. spoke for itself regarding the financial side of the question. He might be wrong, but he was inclined to think that if they could combine in some way coke-oven plant with coal-gas plant and have the installations under one management, it might be a feasible proposition in any future development on a big scale.

Mr. F. P. TARRATT (Newcastle) said he would like to know to what extent the calorific value varied. There appeared to be coke-oven gas at times, sometimes only water gas, then coal gas, and sometimes all three. What was the variation between the coke-oven value and the ordinary supply to the town? He did not suppose it would be much over 500 in the ordinary way; and what quantity of oil would be required for the water gas to reach that?

Mr. A. W. BRANSON (West Hartlepool) mentioned he had had about seven years' experience of supplying town gas from coke ovens when in South Wales in 1907. He believed it had been done at Lanchester, too, by Messrs. Sadler. In South Wales they supplied a large population over an area of 60 sq. miles, covering 20 or 30 colliery towns and villages. The five small gas-works operating prior to that were unable to earn dividends for years. The coke-oven supply was adopted gradually, and in 15 years the whole of the area was being supplied and developed in a way that would not have been possible otherwise. The supply was made with steel mains to as far as 15 miles from the ovens. It had been a great success. During the seven years he was there the consumption increased by 304 p.ct., and he understood it had been going on at a similar rate since. The gas was taken from the ovens' holders by means of exhausters—not, as in Mr. Blincoe's case, from a separate hydraulic main. It was of even quality, 460 to 470 calorific value. The Company then supplied an illuminating standard and used benzole for enriching. The benzole had a tendency, however, to drop in the mains. Now that the illuminating power standard had been abandoned, the use of benzole was discontinued, and they were working very well indeed.

Mr. BLINCOE, replying to the President's question about the delivery of the gas, said it was delivered by exhauster, which drew the gas from the ovens and through the whole of the plant, the exhaustion being at the end of the plant. The gas was delivered direct into the main at a pressure of 6 in. When the main was cleaned, the pressure at the outlet of their exhauster was about 2½ in. to 3 in., and to-day it was about 3½ in. If they had not had a main of that capacity, they would not have got over the difficulty in midwinter when large accumulations of naphthalene took place. By steaming and flushing with benzole, they were enabled to carry on until the main could be cleaned—but that was a story worthy of a paper in itself. The total sulphur content when the gas was at the outlet of the purifiers was only from six to eight grains per 100 feet. In normal conditions he did not think the interruptions were any more frequent than in ordinary gas-works, especially when near blast-furnace plants, which required regular operation and were not closed-down except in extreme depression. Where a coke-oven gas supply was hit most was during strike conditions, as storing was a difficulty with them. Regarding the future, their output now would almost warrant the coal-gas plant in a short time being in operation all the year round. As to Mr. Tarratt's point, the calorific value ranged from 550 to 570 when supplying coke-oven gas alone; and he thought if the coke-ovens exercised the same care as they did, there would be no difficulty in the twin mains in maintaining a regular quality. During the coal strike it was a different matter. Even gas-works, he had heard, descended very low. During the strike they managed to supply 420 B.Th.U. That was made up of carburetted water gas and a small quantity of coke-oven gas. He found that in the water gas about a gallon of oil per thousand increased the calorific value about 100 B.Th.U.

Mr. D. CURRIE moved, and Mr. A. W. BRANSON seconded, a vote of thanks to the authors of the papers, which was heartily carried.

Effect of Physical Conditions during Carbonization upon the Quality of Coke.

At a meeting of the Midland Section of the Coke-Oven Managers' Association, a paper upon this subject was read by Mr. Thomas Biddulph-Smith, who said it is well known that, when rough coal is carbonized, the product obtained is more friable than when the coal is finely ground. The statement is generally accepted that the distillation products, during the greater part of the carbonization period, leave the charge at the wall-face. But with this the author ventured to disagree; and in his consideration of the subject assumed that distillation proceeds inwards, with an upward tendency towards the middle of the oven. Tests were made with two samples of the same coal—the first dry (*i.e.*, containing 3 p.ct. natural moisture), and the other with a moisture content of 10·5 p.ct. These samples were carbonized under identical conditions, and after carbonization were cut into sections from which surfaces were prepared and photographed. In both instances the surfaces chosen were those which had been in a vertical plane at right angles from the wall, and equidistant therefrom. The photographs showed that the dry coal produces a coke of a much closer grain and of greater strength than the wet sample. Thus depreciation of the quality of the coke due to the presence of moisture is considerable. A good class coal will produce a better coke on compressing to 40 p.ct. reduction in volume when it contains only 5 p.ct. moisture. In practice, however, 10 p.ct. of moisture is necessary, and at this figure the depreciation due to the moisture is not counterbalanced by the improvement due to the compression. In the case of poor coking coal, however, with 10 p.ct. moisture and 40 p.ct. reduction in volume, the quality of the resultant coke will be increased by about 40 p.ct. The figure of 40 p.ct. reduction was obtained by laboratory experiment. The evidence adduced by the author showed that the further one gets from the oven wall, the greater will be the volume of gaseous products passing through the mass, and the greater therefore will be the porosity of the coke as one passes from the walls to the centre of the oven. Thus, if narrower ovens were used, the average resultant product would be of a closer texture. As to speed, the rate of carbonization of poor coals should be increased so as to lengthen the interval between distillation and solidification of the binding material to such an extent that all of the binding material is used in coagulating particles of coal. Since the higher temperatures needed for this are only possible with silica walls, the installation of these at plants carbonizing poor coking coals would appear to be a sound proposition. These arguments as to speed do not apply to good coking coals.

Southern Association of Gas Engineers and Managers.—In accordance with the invitation extended by the Chairman (Mr. Walter Hills), on behalf of himself and his co-Directors in the Isle of Thanet Gas Company, at the recent meeting of the Association, members and ladies will visit Margate on Thursday and Friday, the 25th and 26th inst. At 5 p.m. on the first-named day, the May meeting of the Eastern District Section (to which all members from the West are invited) will take place at the Gas Offices, Addington Street, Margate, when various subjects are to be discussed; and on Friday morning the gas-works will be opened for inspection under the guidance of the President (Mr. J. M. Campbell) and his staff. Luncheon with the Directors at the St. George's Hotel, Cliftonville, will be followed by a motor drive to St. Margaret's Bay, to inspect the new water-supply pumping machinery (by permission of the Mayor and Corporation of Margate, and the courtesy of the Borough Engineer, Mr. E. A. Borg); and there the Directors of the Company will provide tea. Thus an extremely enjoyable time is promised. The Hon. Secretary and Treasurer (Mr. W. H. Bennett, of Redhill) has prepared, for the benefit of those intending to join the party, a list of trains and hotels.

SIDELIGHTS ON SELLING GAS.

By Norton H. Humphrys.

II.—The Ultimate Objective in the Sales Department.

The gas-works sales department that stops dead at the delivery and installation in proper working order of gas appliances on the premises of consumers, is in unhealthy, half-starved, and dwarfed condition. The department may certainly pay its own footing, if it does not contribute substantially to the profits and thus assist a cheaper price for gas; but gas undertakings are not in the position of plumbers and ironmongers, who are out to buy at £80 and to sell at £100, with no interest in the transaction outside the margin so represented. Their ultimate objective extends beyond the trade profit—to augmented sales of gas and the numerous advantages attendant thereon. The first condition should always be subordinated to the second.

For various reasons, the commercial policy practised by the gas industry, regarded as a whole, has always been sadly behind the times. Notable exceptions can be instanced; but the assertion holds good in a general sense. In the early days, attention was concentrated on gas manufacture, under the impression that, given a good article at a reasonable price, the sales department was a superfluity. This attitude was not a feature special to the gas industry, but a reflection of the commercial policy peculiar to the period. A general impression existed to the effect that an aggressive sales department was practically a confession of inferior goods; and old-established substantial firms were accustomed to boast that they had never asked for custom. Extensive advertising or canvassing was looked at as akin to charlatanism. The steady development of activity in the sales department has also been common to all, and not special to the gas industry, which—again speaking in a general sense—has followed with lagging footsteps that have left it a long way in the rear. One need not go far to find relics of the early practice, particularly in the boardrooms of the smaller class of gas undertakings. A paragraph in the annual report to the shareholders may dwell complacently on the large number of gas appliances that have been placed during the year, and on increased sales of gas; but these two items are not *ne plus ultra*, as other circumstances, beneficial or otherwise, are concerned in real progress.

The first important stage in gas industrial development was the encouragement of its use by placing out appliances on favourable terms, such as cost price, hire-purchase, or direct hire at low rates. Many have not yet advanced beyond this point, and assume that the placing of an appliance is much the same thing as reasonably constant usage, and that people will not incur even a slight expense if they do not want the gas. Extended experience shows, however, that, for one reason or another, quite a substantial percentage of the cookers or fires are not regularly used, or tend to drop into a back seat when the novelty has worn off. Therefore, broad figures stating the total number of appliances placed, and the total increase in sales of gas, are not entire and complete evidence of permanent prosperity and stability. An addition of 5 or 6 p.ct. to the number of appliances placed during the year, and about a similar increase in the cubic feet of gas, or number of therms, sold, are quite consistent with the existence of breaches that may widen year by year until they acquire serious proportions. A 5 p.ct. gross increase may be composed of a doubtful 10 p.ct. advance in one direction, together with 5 p.ct. of a more promising branch of business gone over to the enemy in another; a larger increase in the slot meters, with a corresponding decrease in the ordinary; or a loss in one street covered by a gain in the next. The totals may prove delusive; the real consideration is the increase or decrease in each district, street, and house.

Some 75 years elapsed before the hiring-out of appliances became general, and even then its rapid development was accelerated to a greater degree by the enterprise of manufacturers in the organization of exhibits, lectures, and demonstrations than by activity in the boardroom; though, after a time, the fact was recognized that if manufacturers could afford such expenditure, gas suppliers need not hang back. Still another thirty years passed away before the formation of the British Commercial Gas Association; and many have not yet overcome the established caution to an extent sufficient to warrant the entry of their names on the membership list. These activities might well have been predated by quite a long period, to the substantial benefit of the present-day sales of gas. Even with past experiences in view, the utterances by Mr. Bloor, Mr. Creasey, Mr. Sandeman, and others, who not only preach but practise a more aggressive policy than that represented by a clerk waiting behind a desk in the gas company's rental office, are like voices in the wilderness.

One explanation of this state of affairs is the tendency to undervalue, understaff, and underpay the responsible executive. The head officials may receive adequate remuneration; but there is too wide a hiatus between the salary paid to the secretary, engineer, or manager, and to the second in command, or the heads of departments. The doubtful prospect of eventually obtaining a managership is not sufficient to tempt promising candidates to accept positions in the gas office or works at lower salaries than they could command in other directions. The running of the undertaking seems such a simple business to the new director anxious to win his spurs, or to a colleague of longer standing whose ideas do not soar beyond next year's dividend. Only one technical head, and a staff of unskilled clerical helpers; only so many tons of coal to be carbonized, and of coke to be sold; only gas accounts to prepare and collect, four times in the year! How do the staff contrive to evade the temptations that await idle hands? There is ignorance in the boardroom as to many details indispensable to competent working of the business; and if the British Commercial Gas Association does nothing more than remedy this defect by means of conferences and otherwise, its existence will be justified. Expenditure representing thousands sterling may pass without comment, followed by a long haggle over a £20 rise in the salary of a subordinate official; and so pence are taken care of in one direction, while £5 notes blow out of the window in another.

The installation of a gas appliance is not, and should not be regarded as, the final chapter. The sales department is not complete that does not include periodical examination of the quantity of gas used, considered in relation to the appliances supplied by each meter. If an average size cooker is fixed, and the subsequent consumption does not exceed 2000 c.ft. of gas per quarter, it is up to the selling department to discover the reason, which may turn out to be beyond control, but more likely a small matter due to ignorance, carelessness, prejudice, or mishap, and one which can be easily corrected. And the objective is not only to sell, but also to receive the full price.

There is now greater difficulty about the detection of "slow" meters than in the old times when the consumption of gas was so nearly even, quarter by quarter, that a comparison with the corresponding periods in previous years was sufficient. With the enormous number of uses to which gas can be applied, temporarily as well as permanently, the variations are both more irregular and more extensive. Many gas undertakings find the extra cost of a mid-quarter check index reading a wise expenditure. An intimate acquaintance with the circumstances in which gas is consumed is desirable, if only for use in the rental office; and for unravelling doubtful accounts, there is nothing like an inside knowledge as to the happenings on the premises concerned.

Primeval ignorance of the methods and precautions to be adopted by users of gas has long since become obsolete. The maidservant from the country, apt to blow out the flame on a fishtail gas-burner in the same manner as she would extinguish a candle, in preference to the orthodox turning of the tap, or to light-up the gas-cooker in the morning at the same hour as she was accustomed to start the displaced coal "kitchener," or the householder who insists on all gas piping being removed from the premises before he will enter into possession, are nothing but relics of the past. Nor is there stringent need for cautioning against searching for a leakage with a naked light, once not only necessary to gas consumers, but also to fitters. A usual experience, after the quarterly distribution of accounts, was the return of a dozen or more with the indignant endorsement that "we never could have used the gas;" but now a whole year may elapse without the receipt of a similar complaint.

Yet modern conditions leave more for the gas salesman to contend with than he would have encountered in the old days. The primeval ignorance is now represented by a sort of educated ignorance, the offspring of the little knowledge that is a dangerous thing, or of accepting misrepresentation, imagination, and assumption as being the same as fact. One who frankly does not know, and is willing to learn, is easier dealt with than another who thinks he knows, and therefore need not be told, or has acquired prejudice, which may be genuine or purposely assumed. The second class demands a wider degree of knowledge, tact, and discrimination than the first.

We may all keep a keen eye on new business prospects, and perhaps have to some extent dropped the substance of existing opportunities in favour of the shadow of extensions—running after the prospect, and leaving the customer of old standing to shift for himself. But how many have followed the line taken by Mr. Bloor to such extent as to be capable of correctly assessing the value of influences and causes that are antagonistic to sales of gas, which probably vary in every district according to local circumstances, though some—such as weak or inefficient supply—are common to all? The existence of a low order of appreciation, to such an extent that a cursory assurance that "the gas supply is all right" may conceal serious defects, is not peculiar to York. And the raising of this standard is quite as important as the gain of a street or two of new business.

We are not always wise in ignoring insidious endeavours emanating from interested quarters to create a feeling of alarm, distrust, or suspicion in the minds of established consumers. The exact extent of such influences may not be evident; but it is there. Insinuations to the effect that gas destroys the life-giving oxygen in the atmosphere, replacing it with poisonous and corrosive constituents, or that the household distributions to various apartments are of necessity attended with leakages of unconsumed gas to a sufficient extent to taint the air, so that life may be prolonged by banishing gas from the dwelling, appeal to, and take hold of, some orders of mind with greater strength than plain unsensational fact. Then there is the suggestion that gas is as much a back number as the tallow candle, and therefore the replacement of worn-out gas appliances by modern and more efficient appendages is a foolish expenditure.

All this may appear too contemptible to be worth notice, but is sufficient to tip the scale against the use of gas, especially in new buildings claiming to be up-to-date. A dignified silence may be taken as tacit admission that such arguments are not answer-

able. In some districts there is no occasion to stir up the mud; in others, the disparagements are of the sort that stick, and should therefore be actively resisted.

Following Government example, there is too much tendency nowadays to increase departments to an unwieldy degree. Consumers prefer to deal with one or two known and familiar individuals, and do not like a number of strangers about the house. Where there are a dozen or more "departments," there is difficulty in locating or defining the one required. Too many cooks spoil the broth; and too many departments may prejudice business prospects. Therefore these remarks are not intended to suggest the addition of another "department."

PHYSICAL AND CHEMICAL SURVEY OF THE NATIONAL COAL RESOURCES.*

THE Fuel Research Board of the Department of Scientific and Industrial Research are engaged on a highly useful piece of work. It is the physical and chemical survey of the national coal resources. No. 1 report has been issued, and deals with the correlation of data for the Yorkshire, Nottinghamshire, and Derbyshire coal-field. More than one gas engineer has lately deplored the fact that there are no data existent which would be of value in enabling, at all events to some extent, judgment to be made of coal from different sources for the various purposes for which it is required. No data, in our opinion, can be collected and published which will give exact information as to qualities for any particular purpose, and which can be counted upon as being constantly reliable. There may be a rough-and-ready approximation to values, which would be of some, but not of definite, guiding use.

There can be agreement with the Fuel Research Board—in fact, this has long been felt—that an important aspect of the great problem of the conservation of the national coal resources involves the study and classification of the coal seams which are at present being worked or developed; also of seams or portions of seams which are being left unworked, or are thrown aside above or below ground. This study and classification, on its directly practical side, will deal primarily with the suitability of each coal for those purposes for which its individual qualities render it most adequate—for gas making, coke production, steam-raising, or for domestic use. Though the war caused delay in the work of organizing the survey, progress has been made in the collection and correlation of data already available. To realize the most effectual performance of the practical side of the work, the Board are of opinion that the help should be secured of local Committees, with which would be associated colliery owners, managers, and consumers, together with representatives of the Board and the Geological Survey. With respect to the coal area dealt with in this first report, although the systematic physical and chemical examination of the seams has not yet been taken up (this would require a considerable time), the Board believe the present concise account of the various seams will be found of use in itself; and it is accordingly published now. The particulars have been collected from the Memoirs of the Geological Survey of England and Wales. The Geological Survey have also supplied two maps—one showing the outcrop of the Barnsley (Top Hard) and Silkstone (Black Shale) seams, and the other portions of various collieries.

Turning to the data, the information is given that the East Midland coal-field is roughly oval in shape, and amounts to 2136 square miles, or about twice the size of the South Wales coal-field. For the whole area the net available supply of coal is estimated at 26,498,731,495 tons. In the tables, in each area the seams of coal are arranged in descending and correlative sequence, and are numbered in Roman figures. Each seam has an additional number and a letter—the number indicating the division of the United Kingdom, and the letter the area. The tables show that the chief workable coals are most numerous in the Middle Coal Measures. Some of the seams possess distinctive characters which remain constant over considerable areas. The seams of the Lower Coal Measures, in comparison with those of the Middle Series, are few in number, and of less commercial value. This distinction does not, however, apply to the southern part of the Derbyshire area, where the Kilburn Coal, 400 ft. below the Silkstone Coal, is a thick and important seam, or to the northern part of the Yorkshire area, where the Beeston and Better Bed coals are highly prized. Then follow details of the coal seams. Although the details given are quite of a general character, there is genuine value in them. More still will be at command when the physical and chemical data are available.

* Physical and Chemical Survey of the National Coal Resources. No. 1—Correlation of Data for the Yorkshire, Nottinghamshire, and Derbyshire Coal-Field. London: H.M. Stationery Office. Price 2s. 1½d. post free.

From particulars published with regard to the coal-tar dye industry in Russia, it appears that in 1913 and 1914 the production of these dyes was carried on mainly by ten firms; and the factories situated in present-day Soviet Russia (including the Kuban district, the Ukraine, and Siberia) produced about 8000 long tons. To-day the industry is controlled by a Bureau for Aniline Manufacture, which in 1921 supervised seven factories, of which five were in operation.

NOTES ON THE MACLAURIN CARBONIZING PROCESS.

By MACLAURIN CARBONIZATION, LTD.

[A Paper presented to the South Wales Institute of Engineers, at Cardiff, on Thursday, April 20.]

The Maclaurin process of carbonizing coal differs from other low-temperature processes in being independent of all external heating. In this respect it resembles an elongated producer, or blast-furnace, rather than a retort. In general proportions the Maclaurin plant is similar to the blast-furnace, but on a lesser scale. The height of the plant is about 40 ft., and its width at the combustion zone about 8 ft. It naturally differs from the blast-furnace in being arranged for the withdrawal of coke from the bottom; or (in the case of poor fuels) an unfluxed residue; while the blast-furnace is arranged for molten iron and slag.

The Maclaurin plant, being designed for a large production of oil, differs also from the blast-furnace in the upper portions, where means are provided for trapping the condensing oils. The coking of the coal and the distillation of the oil is done entirely by the hot gases formed in the lower parts of the producer, due to the combustion of a small portion of the fuel. These hot gases pass upwards, gradually heating the coal in the upper layers, and carrying with them the oil vapours given off. When these gases come in contact with the colder fuel being charged into the plant at the top, condensation of the oil takes place on this fuel; and by an ingenious trap the oils are carried off, preventing their trickling-down into the hotter regions. Binding-up in the plant is thereby almost entirely eliminated, and oils which have suffered almost no decomposition are recovered. The fuel, after being stripped of its oil, passes down into higher temperature zones, and after a period of cooling is withdrawn from the plant.

The adaptability of the Maclaurin plant is one of its principal features. It can handle a great variety of coals, and will make a satisfactory coke or smokeless fuel from non-coking as well as from coking coals. Owing to the gradual heating, unless with fairly strongly coking coals, little binding together of the coke takes place. The coal is over twenty hours in being heated-up to the coking temperature. The plant takes coal as large as will pass the bell, 8 in. to 9 in., down to doubles, but will not deal with dross. The blast can be readily controlled, so as to produce an easily-ignited smokeless fuel or a hard grey furnace coke; or gasification can be carried to completion, and ash only withdrawn from the bottom. The yield of oil is about the same in all these cases. The ammonia, however, increases the more complete the gasification.

SMOKELESS FUEL.

The smokeless fuel produced has been formed at about 700° C., and contains only about 4 p.ct. of volatile matter. It is therefore not a low-temperature product in the generally accepted meaning of the term. It is as hard as ordinary gas-works coke, but is black in place of grey, and is about as easily ignited with paper and sticks as is ordinary coal. The grey furnace coke is harder and not suited for domestic use, but is suitable for metallurgical purposes.

During carbonization any stony matter in the coal tends to drop out, and a large quantity of the adhering mineral matter scales off and is concentrated in the breeze. It is therefore easily possible to obtain a clean coke containing no higher percentage of ash than the original coal; the bulk of the ash being separable as stones or collecting in the breeze.

HEAT LOSSES.

The heat losses in the Maclaurin process are naturally small; being confined to the radiation losses, and the heat carried away by the hot coke and by the gases leaving the producer. As the walls of the producer are very thick, and as the gases leave the plant at about 60° to 80° C., there is evidently very little loss from these sources. The low temperature of the escaping gases also minimizes the work to be done by the coolers and scrubbers.

NATURE OF OIL.

The oil is similar to low-temperature oils in the absence of benzene-naphthalene and anthracene. It differs in having almost no light oils. The presence of light oils in externally heated retorts is almost certainly due to cracking. Later distillation of the oil in stills gives rise to a certain proportion of light oils.

The distillates are characterized by their high percentage of phenolic bodies; the lighter distillates containing close on 50 p.ct. of carbolic cresols and xylenols. The percentage of high boiling-point phenols distilling between 230° and 300° C. is also exceptional. The distillates above 270° C. contain a large percentage of solid paraffins. The crude oil as obtained is a brown waxy oil which can be used direct as a fuel oil.

GAS.

An analysis of an average sample of the gas made over twenty-four hours is as under:

CO_2.	C_nH_m	O_2.	CO.	CH_4.	H_2.	N_2.
6·2	*nil*	0·6	16·0	13·0	16·1	48·1

Calorific value = 247 B.Th.U. gross.

The absence of hydrocarbons other than methane is very characteristic, and is due to the oils not being cracked to any extent. The scrubbed gas is a clean gas free from stringy tars, and therefore ready for industrial use.

Ammonia.

The yield of ammonia when running for coke is about 24 lbs. per ton. The ammoniacal liquors are free from ferrocyanides and sulphocyanide, but contain certain di- or tri-hydroxy phenols, which give strong colours when combined with iron.

The yields in a recent test on a coal with 35 p.ct. of volatile matter and 7·7 p.ct. water were as under:

Yields per Ton of Coal.

One ton coal at 12,300 B.Th.U./lb. = 27,552,000 B.Th.U.

		B.Th.U.
8·05 cwt.	Large coke (smokeless fuel) at 12,600 B.Th.U./lb.	11,360,160
1·16 ,,	Smithy char at 12,196 B.Th.U./lb.	1,584,504
0·76 ,,	Peas at 11,283 B.Th.U./lb.	960,408
0·99 ,,	Breeze or dust at 9203 B.Th.U./lb.	1,020,428
10·96 cwt.		14,925,500
15·6 gallons oil (dry) = 1·44 cwt., at 16,600 B.Th.U./lb.		2,672,600
27·731 c.ft. gas at 247 B.Th.U./c.ft.		6,849,557
		24,447,657
Calorific values of:		
One ton coal		27,552,000
Coke, gas, and oil from same		24,447,657
Loss		3,104,343

= 11·3 p.ct.

Turning now for a moment to the economies of the process. No process can be economically satisfactory in which the increased value of the products obtained is not sufficient to pay for the labour and meet the interest and depreciation charges incurred in obtaining these more valuable products. To enable this to be done in the case of coal, the products must either have a very high value or the labour costs and capital cost must be very low.

The capital cost of the Maclaurin plant, owing to its extreme simplicity, is exceptionally low. The depreciation, partly on this account and partly because of the small extent of highly-heated brickwork, is also very low. As the coal is dealt with in bulk—about one ton being charged into each unit every hour, and the equivalent in coke withdrawn—the labour charges are low.

The total costs are estimated at 27s. per ton, allowing 25 p.ct. per annum on the capital cost for interest, depreciation, and repairs, and adding the cost for coal, at 20s. per ton, labour, power, steam, rates, &c., for a 10-unit battery dealing with 200 tons of coal per day. At the above price of coal, 4d. per gallon for the crude oil and ½d. per pound for the ammonia seem reasonable values to place on these products. In these circumstances, the gas and coke combined, allowing nothing for the breeze, would need to fetch 20s. in order to make the process pay. This would mean that if the gas could be sold at 2·3d. per therm (a very reasonable price for producer gas), the coke could be produced at 15s. per ton; or alternatively, if the clean coke can be sold for furnace work at 28s. (which is about its value for this purpose with coal at 20s.), then the gas can be sold at as low a price as 1·24d. per therm. This brings it well under the figure at which producer gas can be made when coal is costing 20s.

The Koppers Gas-Governor.

It is pointed out by the Koppers Company, of Pittsburgh, that, though coke-oven practice demands the regulation of very low pressures, the principal is the same for any pressure; and only the float arrangement of the governor needs to be changed to meet conditions. This applies also to liquids. The Koppers gas-governor is operated on the hydraulic principle; turbine oil being the circulating medium. A direct-connected motor-driven centrifugal pump furnishes the circulation at the desired operating pressure. Pressure variations in the collecting main are transmitted through suitable piping to a float chamber in the governor. When the pressure is building-up, and consequently raising the float, the link connection forces the right-hand end of the lever upwards. The fulcrum of this lever is at its left end, and is supported on an adjusting roller, which is attached to a lever. As the lever moves upwards, it draws upwards a specially designed pilot-valve, and allows oil under pressure to flow to the right end of the relay valve. The left end of this special valve is under constant pump pressure; but the right end is of greater diameter, and so proportioned that, when a certain smaller unit pressure acting on its large face is exceeded, the piston will move to the left. This movement opens ports allowing full pump pressure to be transmitted to the main cylinder, forcing the piston upwards. By the same motion of the relay valve, the pressure in the main cylinder is relieved to the exhaust, and oil returns to the circulating tank. The lever is thus moved on its fixed central fulcrum at the shaft, so that the left end travels upwards, thus throwing the valve-operating lever connected to the shaft to the right, and by suitable linkage opening the butterfly valve to relieve the collecting main excess pressure.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Leeds Fireclay Works.

On Wednesday afternoon, April 26, some fifty or sixty members of the Yorkshire Junior Gas Association paid a most interesting and instructive visit to the works of the Leeds Fireclay Company, Ltd. The inspection took place at the Ingham's and Cliffe's branches, at Wortley, where the Company specialize particularly in gas retorts, refractories, and materials generally for use under heat. At these works they also have a large output of cold pipings, drainage equipment, gullies, bricks, &c. The Company have eight branch works in different parts of the Leeds district, and three clay pits. At some of their other branches they include the production of the highest-class glazed brick and tilings for building and structural decoration purposes.

The party from the Yorkshire Junior Gas Association, naturally, were interested specially in the making of retort and heat-withstanding materials. They were led by the President (Mr. P. M'Nab. In the unavoidable absence in London of the General Manager of the Company (Mr. H. J. C. Johnstone), the visitors were met by the Works Manager of the Ingham's and Cliffe's branches (Mr. J. Benn), who offered them a brief welcome, and then divided the large gathering into four parties, under the conductorship of himself, of Mr. M. Barrett (Chief Chemist, who is one of the original members of the Refractories Research Committee), Mr. N. Loxton (Assistant Chemist), and Mr. W. Mees (Commercial Representative).

The parties were taken first to the large accumulations of raw material—a blue-grey and hard clay brought to the works from the pits, a mile-and-a-half to a couple of miles away, by electric tramway trucks. The conveyance is by arrangement with the Leeds city tramways department, and is believed to have been the first use in this country of municipal electric tramways for industrial goods transport. After a prolonged period of weathering, the clay is proportioned, and, as was witnessed by the visitors (who had the advantage of seeing the place on an ordinary working day), is ground finely in edge-round mills, driven by power belting, and is afterwards very thoroughly "pugged." After a short period for ageing or souring, the material (now a plastic mass) is passed by hand labour into the vertical steam-driven extruding press, yielding on a lower floor a perfect hollow column of material over 10 ft. long and of the cross-section dimensions of a gas-retort. The column is then protected by boarding and ropes, and conveyed by truck, steadied by an overhead crane, into the drying stoves, where it joins the large stock of similar productions, and when sufficiently dry is inverted and the mouthpiece built on to it. After sufficient stay here for drying, the retorts are conveyed by overhead cranes to the kilns for burning. The kilns have exterior coal firing; the heat entering the chambers direct, and passing out through gridded flooring. The temperature employed in the burning process is high, reaching about 1350° C.

The visitors were also shown the various processes of mixing, shaping, and burning furnace blocks, coke-oven blocks, hand and machine made bricks, special aluminous refractories, and the Company's new carborundum blocks, as well as the various operations involved in the production of drainage ware. The guides explained everything in detail, and gave every facility for personal examination; so that the visit was highly informative to a party dependent in their own industry on the products of such works as these. Subsequently the visitors were entertained at tea by the firm in the general offices.

The President said it was due to the Company and to those who had acted as guides that the thanks of the Association should be given not only for hospitality and an instructive afternoon, but for allowing the visit while work was in progress.

Mr. J. M'Lusky (Calverley and Horsforth Gas Company), moving a vote of thanks to the Chairman, Directors, management, and staff of the Company, said most of the members of the Association knew beforehand that the firm had wide ramifications in their operations, but to see their well-known productions in the making had been a matter of the greatest interest. Many of them had never before witnessed the manufacture of retorts by machinery; and they must all have been greatly struck by the care bestowed in the mixing of the fireclay and the drying and burning of the material.

Mr. J. B. Balmforth (Bingley), seconding, remarked that when they considered the vital importance to the gas industry of the manufacture of retorts and refractories, it was surprising how comparatively little most of them knew about the preparation of the materials. The Company had set themselves to meet the requirements of the gas industry by using every endeavour to make the best possible article.

Mr. J. Benn, responding, expressed the regret of Mr. Johnstone at his unavoidable absence, and voiced the thanks of the Directors and his own colleagues for the appreciation shown by the visitors. The Company were always trying to improve on even their own best work. It was their earnest aim to maintain steady improvement in the quality of retorts and materials. They had devoted much time and attention to this task. There had, of course, been many difficulties to contend with during the war and post-war periods; but these were being overcome, and the Company felt confident they could supply materials equal to those of any producers in the country. If any members were especially interested in some particular point of the many phases of work seen that afternoon, the Company would be glad of a further visit and

a private look round at any time, if an appointment were made. Any information that could in any way be useful to a gas engineer would be given, if it were within the power of the Company to give it.

Mr. J. D. Lupton, of the Otley Gas Company, was initiated to membership of the Association.

It was announced that the next meeting would probably be on May 20, at the Harrogate Gas-Works.

Extracting Sulphur from Spent Oxide.

According to a note in the "American Gas Journal," a process has been patented in the United States and assigned to the Stevens-Aylsworth Company, for extracting sulphur from spent oxide. The oxide is placed in an extractor tank provided with suitable charging and discharging openings. The solvent used—benzole—is stored in a tank situated at a higher level; and the liquid is allowed to run down by gravity and fill the extractor until the spent oxide is entirely covered. The solvent is allowed to remain in contact with the oxide for about one hour, during which time it extracts a large amount of sulphur from it. The solution is then syphoned into a still, while an additional quantity of solvent is permitted to flow into the extractor so as to remove the surplus still contained therein. The solution of sulphur in the still is then distilled; the jacket of the still being heated with steam. Both water and benzole vapours are evolved and passed through a water separator, from which the benzole is recovered. The sulphur is allowed to accumulate in the still; and after a sufficient quantity is collected, it is melted, and flows out through a suitable opening. After all the sulphur has been extracted from the spent oxide, steam is passed into the double jacket of the extractor, and the remaining benzole in the solvent is finally distilled off.

Sulphurous Coke and Chimney Damage.

"Das Gas- und Wasserfach" gives an interesting account, from a recent number of the monthly bulletin of the Swiss Gas and Water Association, of a case of damage to a 100-ft. chimney in a Swiss gas-works. The chimney was iron-bound at regular intervals, but near the top there appeared bulges of considerable size, with corresponding cracks in the brickwork. It was connected with two batteries of ovens with settings of nine retorts; and the waste gases, before reaching the chimney, passed through a waste-heat boiler, which reduced their temperature to about 200° C. It was thought that the damage might be due to the action of the waste gases, especially as coke high in sulphur was used in the producers. An analysis of mortar from the chimney proved that this was the case. By the action of sulphuric acid, all carbon monoxide had been removed from the material; and of substances insoluble in hydrochloric acid only silicates were present, mainly in the form of aluminium silicate. With this action of sulphuric acid on the mortar, there was found to be a considerable increase in the volume, which, of course, accounted for the bulges in the chimney. Doubtless the gases from the sulphurous fuel had been so cooled in the chimney that water had condensed out, and with it a solution of sulphurous acid, which oxidized to sulphuric acid. In the case in question, the condensation had perhaps been helped by the fact that one battery of ovens had not been working, so that the volume of fumes through the chimney had been halved.

The Venturi-Evase-Prat Stack.

Mr. A. W. H. Griepe, in the "American Gas Journal," says that in the United States very few installations of the new Venturi stack system have been made. He believes this is partly due to conservatism, and partly to the low efficiency claimed for this type of stack; but the introduction of a new design of high-pressure centrifugal blower has increased the efficiency to such a degree that the Venturi stack system can compete with any on the market. The arrangement consists mainly of a stack of a shape similar to a Venturi tube, and a fan or blower. The discharge of the fan, by means of a pipe, is led into the stack, terminating in a conical nozzle. The air under pressure creates a draught at the bottom of the stack, accelerating the natural draught. The blower, driven by a motor with variable speed or direct connected steam turbine, will meet all draught conditions. Advantages of the system are low cost of installation, flexibility of operation, and small cost of maintenance. About one-third of the material required for natural draught stacks is necessary for the Venturi stack—not considering the heavy foundation for the former. To overcome the objection to steel stacks, the writer has designed a concrete stack containing all the features of the steel stack—with the advantages of the concrete stack, and reducing the height of the stack to be used two-thirds. The blower does not handle the hot gases, fumes, &c. The gas industry will, says Mr. Griepe, have to adopt, sooner or later, new methods to increase the efficiency of the plants; and one of the most vital points is the cost of fuels. The Venturi stack will prove to be an immediate success, as this system will take care of all draught conditions due to variation in the fuel used. The low first cost of installation will appeal to any plant manager when the question of waste-heat apparatus is under consideration. When the handling of obnoxious fumes is necessary, the Venturi stack system will be found to be the only one that can be depended upon.

COKE-OVEN GAS FOR TOWN'S USE.

In last week's issue (p. 269) we published a paper under the above title read by Mr. T. NICHOLSON, of Willington (near Durham), before the Northern Section of the Coke-Oven Managers' Association at Durham on April 29. There ensued the following interesting

DISCUSSION.

Mr. A. H. THWAITES (the President of the North of England Section) opened by remarking on the evidences of painstaking work in the paper. He would like Mr. Nicholson's opinion as to whether he thought the success of the scheme was due to the fact that they had Semet-Solvay ovens.

Mr. NICHOLSON remarked that he would not like to agree that this was the case, though undoubtedly Semet-Solvay ovens had features not possessed by other ovens. From the experiences they had had in taking lighting gas from ovens, he would be rather inclined to say that it was more a question of management, irrespective of the type of oven. In reply to a further question from the Chairman, he said that it would be quite impossible for him to state accurately the amount of surplus gas available for lighting. All he could say was that if they were not using it for lighting the Willington district, they were using it for power purposes, as he had mentioned in the paper. They were certainly not throwing any away. As soon as they finished taking gas from the coking plant, it was immediately turned back to the boilers.

A lengthy discussion followed between Mr. Nicholson and Messrs. Bagshaw (Sunderland) and Blincoe (Middlesbrough). Mr. Nicholson replied to the various points. Mr. Bagshaw, he said, had alluded to the different viewpoint from which gas engineers looked at the subject compared with the coke-oven managers. He could well conceive what was in the mind of Mr. Bagshaw, because it struck him that one of the things, so far as the gas engineer was concerned, was the varying quantity of gas he required. There were, of course, exceptions; and he thought that, since he had had much to do with the gas industry, there had been a considerable effort made to increase the day load and bring it more approaching to the night load. When, however, he was associated with gas-works other than Willington, the load used to vary practically every hour of the twenty-four. Regarding the experiments with benzole, he had put them in the paper, although he thought they were rather out of date. He had never before tried to take gas for lighting from coke-ovens, and at the time he thought it might be necessary to have some stand-by, apart from the fact that he saw the candle power was very variable. When he spoke of stand-by in this connection, he meant that possibly enrichment would help them out of some of their troubles when the coke-ovens were held-up. There he made a mistake; for he did not appreciate what the true effects of inerts would be. Mr. Bagshaw during the discussion referred to the jet photometer as being a rough and ready guide. He quite agreed, but at the same time he wanted something which would give them a closer guide than the figures then published; and he believed that Mr. Blincoe had agreed that the result was somewhere about that obtained at Middlesbrough. Mr. Bagshaw asked whether it would not have been better to take off the gas between the ammonia and the benzole scrubber, as it might have saved capital expenditure. To this point Mr. Nicholson replied that there were many *pros* and *cons* to be considered. The quantity of gas they required was so small compared with the production from the ovens that, on the whole, they thought it better to make a clean cut and deal with it separately, so that they could handle it under fair conditions. So far as varying conditions were concerned, on one occasion during a stoppage of the coke-ovens, with the help of the staff, they were just able, by blanking-off thirty ovens, to work thirty for the production of lighting gas.

Mr. BAGSHAW raised the question as to whether or not the retort-house governor could be used in connection with coke-ovens.

Mr. NICHOLSON replied that he had had no experience so far as retort-house governors were concerned. A few years ago he had considered the matter with one particular maker, but the cost was then prohibitive. He would be interested to hear something of a new governor from the Gas Light and Coke Company, as it appeared to him, from what he had heard, to be of a type which might be suitable for coke-ovens. It was, he believed, a sort of butterfly valve operated by a diaphragm; and to his mind this would appear more suitable than a type operated by the bell.

Mr. BAGSHAW inquired whether they had experienced any stoppages in the main between the coke-ovens and the gas-works.

Mr. NICHOLSON replied decisively in the negative. There had been no such thing as a stoppage, either partial or complete. There had been no trouble with naphthalene at all. The reason why he started to use benzole creosote in the Livesey washer was because there was a slight trouble in the district in the winter time. He was not surprised to hear allusions to the low limit of sulphur compounds; but they would appreciate the fact that they were carbonizing a coal very low in sulphur, which easily accounted for it. He believed there were now no limits to sulphur compounds.

Mr. BAGSHAW referred to the statement in the paper to the effect that on one occasion, with 280 B.Th.U. gas the street lamps were lit, but there was no light. He did not quite follow this.

Mr. NICHOLSON could only affirm that they were lit, and there was no light. There was from 53 to 54 p.ct. of nitrogen. It rather amused them at the time.

Mr. BLINCOE said that with such a large percentage of inerts the short flame would not envelop the mantle. The flame would be there, but not sufficient to act as an illuminant.

Mr. NICHOLSON wished to hear whether Mr. Bagshaw or Mr. Blincoe had ever tried to enrich gas with 50 p.ct. of nitrogen in it, as, so far as he could discover, it would not enrich at all.

Mr. BLINCOE remarked that there was an idea that benzole enrichment was not permanent when carried too far into outlying districts. It seemed to get away again.

Mr. BAGSHAW said he had had no experience in enriching gas with 50 p.ct. of nitrogen, nor did he want any.

Mr. G. PHILLIPSON remarked that on one occasion they had had gas

which would not burn at all in an ordinary burner, but when enriched with benzole was sufficient to set the ovens away. He could not, unfortunately, state for the moment the percentage of nitrogen.

Replying to further discussion, the author said that a stand-by supply was essential, even if one had a coke-oven supply. With men of experience, he thought there could be no two opinions about this.

Mr. BLINCOE said that in every case in Germany that he saw, the coke-oven people were compelled to have a gas plant installed, usually carburetted water gas, in case of labour troubles causing the ovens to shut-down. He also pointed out that, in the case of a gas plant, the coke was readily taken up, especially during a labour dispute which closed down the ovens.

Mr. NICHOLSON was convinced that for a town's supply a stand-by was absolutely essential. Wherever supplies of coke-oven gas were taken in the future, the stand-by would be essential. Replying to a remark by Mr. Elliott, regarding the somewhat peculiar surplus from waste-heat ovens, he said that where they had only a battery of (say) thirty small ovens, they would need all their waste heat for power, and possibly more. But where they had 120 ovens such as at Willington, it altered the position entirely.

Mr. W. DIAMOND asked whether the ovens were isolated when taking-off the town supply.

Mr. NICHOLSON replied that they did not isolate the ovens, but they had to be much more careful, and had to regulate the exhaust suction more carefully. A further question might be asked in that connection: Was there a terrific waste when slowing down in order to get gas of a reasonable composition for lighting? There, again, it was purely a matter of circumstances. Of course, they were able to do much better now than years ago; but if they kept the hydraulic main clean, the ascension pipes clean, and ran at anything like normal speed, the waste was not at all excessive.

Mr. H. MORDECAI asked what quantity of surplus gas was available, and whether using compressed charges as against top charges had any different effect on the gas supply.

Mr. NICHOLSON said that he could not give other than approximate figures, and they had no means of measuring the gas. He believed very few coke-ovens had. With regard to the compression of the coals before charging, he could not give any opinion; but he did not see why it should alter the composition.

Mr. MORDECAI had an idea that possibly the difference in free space between the particles might affect the composition of the gas, though he had no information on the subject.

The CHAIRMAN moved a vote of thanks to Mr. Nicholson for his paper, to Messrs. Blincoe and Bagshaw for giving their experiences as gas-works managers, and to all who had taken part in the discussion.

Mr. PORTEOUS, in seconding, said that the discussion (or rather, useful conversation among themselves) had been most valuable. He believed Mr. Nicholson was nearer Paradise than most coke-oven managers. In the first place, he had one of the best coking coals in the county, with an ash content that made one envious. Mr. Nicholson had said that he had had no trouble with naphthalene. He, too, had worked with Semet-Solvay ovens since 1908, and he could say the same thing. Some of the original mains were taken down during the last coal strike, and they were practically in the same condition as when put up. He was speaking, of course, of the supply of gas to the ovens in that connection. The point as to whether there would be any more trouble if departing from pressed to top charges was interesting. He was afraid there would be more trouble. Many years ago when working an Otto plant of 96 ovens, they were running very comfortably so long as they had compressed charges; but immediately they converted to top charges, their difficulties began. It was not long before they had the 22-in. main with an opening of not more than 4 in. This was a serious state of affairs; but it was an experience of very early days. He did not think that naphthalene troubles would exist to the same extent on a Semet-Solvay plant as on an Otto plant, due to the fact that the latter had usually a dry main, whereas in the Semet-Solvay plant the dip main was similar to that of gas-works.

Gas for Carbonizing, Tempering, &c.

A high-pressure gas-furnace installation described by Mr. J. P. Lafore, Industrial Gas Engineer to the Boston Consolidated Gas Company, for one of the largest commercial heat-treating concerns in that part of the United States, has a gas-compressor with automatic bye-pass, for furnishing the gas at 10 lbs. pressure. By the use of the bye-pass, the pressure remains constant, no matter what the demand is—provided, of course, it is not above the maximum which the compressor can supply (in this case, 12,500 c.ft. per hour). The gas-pipe from the compressor branches off to the different furnaces, where connections are made with the mixing device, at which point all the air necessary for complete combustion is drawn in. There are four furnaces of the oven type—two 27 in. wide, 4 ft. 8 in. deep, and 14 in. high, and two 3 ft. wide, 5 ft. long, and 14 in. high. The furnaces are both under and over fired. Burners are placed along one side near the bottom of the furnace, and fired under the hearth; while on the other side they are placed near the top and fired under the arch. The furnaces, which are placed on a concrete foundation, and consist of a cast-iron shell and firebrick lining, with insulating material between, are used for carbonizing, hardening, annealing, and tempering at temperatures up to 950° C. Very uniform temperatures are obtained with furnaces of what are termed the "car-bottom" type, where the heat cannot be applied under the hearth. This furnace is of the refractory-bed type, with the flame directed down into the refractory bed, which is placed along two sides of the furnace near the bottom. The combustion takes place in the refractory bed; the circulation of heat being up the sides, under the arch, down and across the furnace, and out through vents placed along the sides above the level of the car, and then through other vents in the top of the side walls. There is a sand seal between the sides of the car and the furnace.

NATIONAL IMPORTANCE OF LOW-TEMPERATURE CARBONIZATION.

By DAVID BROWNLIE, B.Sc.Hons. (Lond.), F.C.S.

[Extracts from a Paper submitted to the South Wales Institute of Engineers, at Cardiff, on Thursday, April 20.]

In my opinion, the solution of the problems of low-temperature carbonization is the most important event that has occurred in the industrial history of this country since the invention of the steam-engine. It will be agreed by all engineers that the burning of raw coal is a barbarous, unscientific, and uneconomical proceeding. The reason of this, in the first place, is that raw coal is a very difficult fuel to burn efficiently, because of the volatile matter. Average coal can be said to contain 25 to 35 p.ct. of volatile matter; and during the combustion of raw coal it is almost impossible to prevent the escape of some of these volatile products in the form of black smoke and other unburnt material. Secondly, there can be extracted from the volatile content of coal, by carbonization in closed retorts, a whole series of valuable bye-products which, in the burning of raw coal, are consumed as mere fuel. In addition, the residual fuel left when coal is submitted to carbonization is a much better fuel than coal—burning smokelessly and with a high emission of radiant heat.

Only 20·2 p.ct. (38,000,000 tons per annum) of the total coal consumed in Great Britain is carbonized by the high-temperature methods—the gas-works and the coke-ovens; the other 79·8 p.ct. (149,500,000 tons per annum) being used as raw coal. Allowing for abnormal periods due to wars, strikes, exchange troubles, and other disturbances, and expressed in simple figures, 250,000,000 tons of coal are raised in Great Britain per annum, and used as follows:

—	Tons.	Per Cent. of Total Coal Raised.
A. *Exported*—25 p ct.		
B. *Consumed at Home*—75 p.ct.		
Steam generation:		
(*a*) power purposes	60,000,000	24·00
(*b*) low-pressure purposes	30,000,000	12·00
Domestic	35,000,000	14·00
Coke-ovens	20,000,000	8·00
Gas-works	18,000,000	7·20
Railways	15,000,000	6·00
General purposes	9,500,000	4·80
Total	187,500,000	75·00

With regard to the figures for low-temperature carbonization, there are some very considerable differences in the yields of the various processes; but we can accept as a rough average for the purpose of this paper that a ton of coal yields 14 cwt. of residual low-temperature fuel, containing (say) 7 to 10 p.ct. of volatile matter, 20 to 25 gallons of liquid products (of which 3 to 5 gallons are motor spirit and at least 10 to 12 gallons suitable for "Diesel" oil), 15 to 25 lbs. of sulphate of ammonia, and 6000 to 7000 c.ft. of rich gas (750 B.Th.U. per cubic foot), not taking into account the producer gas used to heat the retorts.

The general ideal of low-temperature carbonization, taking an average coal of 30 p.ct. volatile matter, is to carbonize this coal so as to leave (say) 5 to 10 p.ct. of volatiles in the residual fuel, in order to give it all the valuable properties of coal, combined with those of coke, and to convert the whole of the 20 to 25 p.ct. of volatile matter left into motor spirit, "Diesel" oil, and other liquid products—say, 30 to 40 gallons per ton. At the same time, to obtain all the nitrogen of the coal or sulphate of ammonia—say, 30 to 50 lbs. per ton—and to have no gas at all. The process is therefore quite different from the gas-works ideal of maximum gas output.

Taking the 149,500,000 tons of coal now used as raw fuel, the low-temperature carbonization of this coal would, taking the above average figures, effect enormous economies in Great Britain, altogether amounting to a saving of about £200,000,000 per annum. The net saving in coal by the utilization of low-temperature fuel would be about 75,000,000 tons per annum. In addition, an enormous saving would be obtained by the adoption of the Diesel engine. The universal carbonization of raw coal by low-temperature methods would wipe-out once and for all the black smoke trouble, with a consequent saving to Great Britain of over £40,000,000 per annum. The British Empire has no oil of any importance; and we are practically dependent on other countries for motor spirit, Diesel oil, and lubricating oil. The low-temperature carbonization of the 149,500,000 tons of coal available would give over 500,000,000 gallons of motor spirit and 75,000,000 barrels of oil, which would render us independent of the rest of the world. A home supply of oil would also enable us to develop to the fullest extent the economical Diesel engine, which is infinitely more efficient than the condensing steam engine or turbine; and the saving in this direction alone would be something like 20,000,000 to 30,000,000 tons of coal per annum. Finally, low-temperature carbonization will give us an ample supply of fixed nitrogen (sulphate of ammonia) for the proper cultivation of the soil. The low-temperature carbonization of 149,500,000 tons of coal per annum would give 1,350,000 tons of sulphate of ammonia.

USE OF LIGHT IN HOSPITALS.

The members of the Illuminating Engineering Society at their last meeting had under consideration, in conjunction with the members of the Royal Society of Medicine (Sections of Surgery and Ophthalmology), the subject of the use of light in hospitals.

The task of framing the lines of the discussion was taken in hand by Mr. John Darch; and here we will confine ourselves to a brief notice of the points that he made. He laid it down as axiomatic that, in designing an installation whether of gas, electricity, or other illuminant, there must not be any material departure from Nature's principles of illumination. There should be no glare from visible light sources, reflections, or glaring glassware. This would be unpleasant, not only to nurses and doctors, but might occasion real distress to the sick. On the other hand, insufficient light is also injurious. The characteristic of ward lighting should be one that is quiet and pleasing; and he suggested that this could best be obtained by a system of general lighting combined with local light. The general lighting need not be great—anything from half to one foot-candle, according to the colour of the room; but it must be well-diffused and without glare. With this quiet and inoffensive general lighting, each patient should be provided with his own local light, giving him 3 foot-candles on his book. This local light might be on a short bracket, set close back to the wall, so as not to be in view of the patient—not in the centre of the bedhead, but about 15 in. to the patient's left, to avoid heat on his head, and gloss on his book. He went on to refer to the local lighting on the sisters' and nurses' tables, and later pointed to the decoration of the wards being an important factor in the illumination.

Afterwards, Mr. Darch turned attention to the operating room or theatre; and he holds that, with all the ingenuity that has been expended on the illumination of the operating-table, there seems to have been but partial success. The surgeon is still worried by the annoyance of troublesome lighting; of the shadow of his own head and hands, if there be not an intolerable heat and glare. Sometimes he meets with light that is insufficient, or bad in direction. Mr. Darch's ideal is that light for major and general operations would be that found quite away in the open under a cloudy sky. It seems to him that the effort should be to obtain that same lighting, as nearly as possible, in the operating room both day and night. He proceeded to discuss natural lighting, and afterwards went into the realm of artificial lighting for such rooms. His view is that:

(1) The illumination should be abundant—not less than 25 foot-candles.

(2) The light should be so thoroughly diffused that it would be difficult to get the shadow of one's hand on the work; and vision is easier in a diffused light.

(3) No exposed light sources should exist within the field of vision, although they commonly do.

(4) The colour of the light should be as white as possible, for correct colour estimates are sometimes of importance.

(5) The light must be uniform and steady; even slow alternating current periods may irritate the surgeon's eyes.

(6) Finally, asepsis must be a primary consideration, and no fittings that will collect or disseminate dust should be admitted.

Mr. Darch sees no reason why an operating room should not be entirely clear of lighting fittings, and the best arrangement he can conceive, and that best fulfilling the conditions he lays down, is to light the room entirely from the outside. In all cases wall plugs should be provided for hand or standard lamps or any other light. Direct lighting might be made quite serviceable, if kept on the ceiling, with four or six hemispherical glass enclosures; but it will not be so soft and diffusive as the indirect light. In either case no other light would be necessary. Later on Mr. Darch advocated provision being made for emergency lighting, though risks of failure are now so greatly reduced that to cumber the room with alternative fittings would, in his opinion, be the greater evil. He also put in a word for the dispensers in view of the fact that he has seen dispensaries badly lighted naturally, and worse artificially. He says it would be but a small matter to save the eye strain of reading graduated glass measures in a patchwork background of bottles, and ensure greater accuracy if a small, plain, white screen were placed where required, one to each man. He left out of consideration the lighting of halls, stairs, corridors, and general service rooms, excepting that he dropped a hint to the effect that low drooping electroliers or gasoliers and spreading brackets are unsuitable to a hospital—even in the chapel or the governor's room. Direct lighting, if used, should be from the ceiling, and bracket lights should be protected from the eyes by a dense but narrow semicircular screen in which little light would be lost to the room.

Scottish Junior Gas Association (Eastern District).—A visit of members to the Montrose and Brechin Gas-Works will take place on Saturday, June 10. After an inspection of their works, the Montrose Gas Company will entertain the party at lunch; and subsequently there will be a motor drive to Brechin, where tea will be served.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

High Therm Results with Vertical Retorts.

SIR,—In reply to Mr. Keillor's letter published in your issue of the 3rd inst., perhaps you can spare me a few lines in which to amplify mine of the 24th ult.

It was not Mr. Keillor's tests that I wished to criticize, but his deductions from them as to the respective merits of gas of high and low calorific power. In the following table some of his tests have been correlated; and your readers will be able to judge whether, after all, there is much difference, if the gases are used under like conditions.

High and Low Calorific Power Gases in Old-Type Cookers.

(*a*) MR. KEILLOR'S COMPARISON.

Test No.	Calorific Power per C.Ft.	B.Th.U. Per Hour.	Pressure.	Time.	Efficiency.	Difference.
			Tenths.	Minutes.	Per Cent.	Per Cent.
22	563	10,836	28	17·0	34·66	..
3	412	6,835	14	23·11	40·41	+ 5·75
		(*b*) "UNDER LIKE CONDITIONS."				
26	563	6,424	12	24·98	39·79	..
3	412	6,835	14	23·11	40·41	+ 0·62
22	563	10,836	28	17·0	34·66	..
5	412	10,389	30	16·91	36·32	+ 1·66
24	563	8,800	20	19·65	36·92	..
4	413	8,360	20	19·56	39·05	+ 2·13
		(*c*) NEW TYPE BOILING-RING "B."				
27	563	6,084	20	16·51	63·56	..
17	410	6,218	15	16·47	62·33	− 1·23

It is only what would be expected from experience that Mr. Keillor's 410 B.Th.U. gas, being a mixture of good coal gas and water gas made by steaming in vertical retorts, is of a composition (due to its CO content and low inerts) particularly suitable for giving high efficiency in lighting and heating appliances. This cannot, however, be said of all 410 B.Th.U. gases.

Under the Gas Regulation Act, low calorific power gas of high grade—*i. e.*, with a low percentage of "inerts"—will come into its own. It is the advocates of low calorific-power gas of low grade (due to 40 p.ct. or more of inerts) who are not the best friends of the industry.

W. C. GOODCHILD.

Midland Railway, Chief Mechanical Engineer's Office, Derby, May 8, 1922.

Calorific Power.

SIR,—I was interested in the paragraph of your Editorial Notes with reference to the above.

There is no doubt the consumer is obtaining some advantage in the value of gas supplied as compared with that officially declared. Whether that will be narrowed down by experience, is a question for further practice.

In my case, the average calorific value of gas supplied to date as certified by the Official Gas Examiner acting on behalf of several local authorities was 515·1 B.Th.U., as against 500 B.Th.U. declared.

A. V. BARRACLOUGH,
Gas and Water Engineer.

Aldershot Gas, Water, and District Lighting Company, May 4, 1922.

Therm v. Cubic Feet Charges.

SIR,—Can you or any of your readers explain how it is that undertakings which have come under the Gas Regulation Act are firmly tied to supply gas of a prescribed or declared calorific value, and which gas is strictly examined and tested to secure this to consumers, while municipal and other undertakings which have not come under this Act, but whose prescribed standard is (say) 14 candles, can, and do, supply gas of round about 400 B.Th.U. calorific value without let or hindrance, and at the same time imagine (or allow consumers to imagine) that they are supplying cheap gas?

Thus, suppose the price per 1000 c.ft. to be 5s., and the gas of 400 B.Th.U., there are 4 therms per 1000 c.ft., and the cost per therm is 1s. 3d.; whereas if the gas supplied were 500 B.Th.U. (being about the equivalent of their standard of 14 candles), the cost to the consumer would be only 1s. per therm. This would therefore appear to be most unfair (not to say dishonest) to the consumers; but it is certainly most unfair to those undertakings which have come under the Act, when the charges are used for comparative purposes. That is to say, as shown above, the consumer would be paying 5s. for 1000 c.ft. of 400 B.Th.U. gas; but if he were getting (as he supposes he is) 500 B.Th.U. gas, he would only require to pay for 800 c.ft. to obtain the same therms, and his cost would be only 4s.—a difference in his favour of 20 p.ct. But, of course, the undertaking as such would make a much worse showing financially.

Now that the therm has been made the basis of value and charges, all undertakings should be compulsorily put on the same footing as to testing, examiners, Referees, and charging; and examiners' reports should be published in all cases. Municipalities, being interested parties, should have their examiners nominated and appointed for them by some entirely neutral and impartial agency.

To sum-up, why should municipal undertakings receive preferential treatment as compared more especially with statutory companies who

are compelled strictly to "toe the line?" Let the industry have all round the same treatment and

Fair Play.

May 6, 1922.

N.B.—The therm is now the basis of calculation for costs and charges; and the sooner all interested realize this, the better for themselves.

Tarred Roads and Fisheries.

Sir,—Roads should be tarred with pitch mixed with sand, and no addition of liquids (creosote, &c.). Patent fuel makers use pitch, coal, and no addition of liquids. Mixed with sand, it makes a paste, which could be laid on the roads hot.

It is the creosote which does the mischief. Too much pitch with coal makes the fuel smoke. Reduce the quantity of pitch to agglomerate the sand as much as consistent. It depends upon the nature of the pitch—whether London make, Yorkshire, or Scotch.

Chemin de la Pivote, Toulon, April 30, 1922. C. Dasnières.

REGISTER OF PATENTS.

Manufacture of Solid Fuel.—No. 176,822.

Strafford, W. W., of Hampton-on-Thames, and Pick, S., of Mortimer Street, W.

No. 26,568; Sept. 16, 1920.

This invention relates to a process for the manufacture of solid fuel from anthracite, coke, and other suitable carbonaceous materials, and the distillation of tar during the process. In one way of carrying out the invention, the screenings of "dry" steam and anthracite coals, gasworks, furnace, or blast-furnace breeze or ashes are employed separately or together and ground to a suitable degree of fineness.

A mixture composed of barium carbonate and charcoal in the proportions of two parts of barium carbonate to three parts of charcoal by weight is added to fine coal dust in the proportion of 3 to 12 p.ct. of the barium carbonate-charcoal mixture to 88 to 97 p.ct. of fine coal dust. Of the resulting admixture 5 p.ct. by weight is added to the previously ground mass, and evenly distributed throughout the same by further mixing, after which sufficient crude or refined coal or water-gas or blast-furnace tar is added to coat the solid particles uniformly and bind them together. Next the material is retorted in any suitable way, air being excluded, and the temperature being raised to the point where the solid particles become firmly bonded into a uniform coke matrix; the hardness of the product being regulated according to the requirements of the fuel, by varying the temperature of the retort.

The solid fuel product obtained as described has a high calorific value, is smokeless, and ignites readily from wood, burns in any furnace or ordinary fireplace, leaving a residue of fine ash, while the liquid bye-products resulting from the retorting are free from the pitch fraction and free carbon, and offer great facility of fractionation.

Burners for Incandescent Lights.—No. 176,946.

Marchant, H. S., of Acomb.

No. 1773; Jan. 11, 1921.

This invention relates to gas-burners comprising a tubular member adapted to carry the mantle, and a deflector secured in the open end of the tubular member and adapted to direct the gas over the inner surface of the mantle and to form an annular sheet of flame, whereby the mantle is evenly heated over its whole surface in an efficient and economical manner.

The burner is provided with a number of lugs near its lower end, so as to support the inverted mantle in the usual manner. Beneath these lugs is formed a circular outwardly splayed end which is hollow; and a similarly shaped deflector is secured in the open end of the tubular portion so as to leave an annular space between them. This deflector is made hollow and closed at its lower end, and provided with a series of holes communicating from the hollow interior of the deflector to the annular space between the outer surface of the deflector and the inner surface of the tubular member.

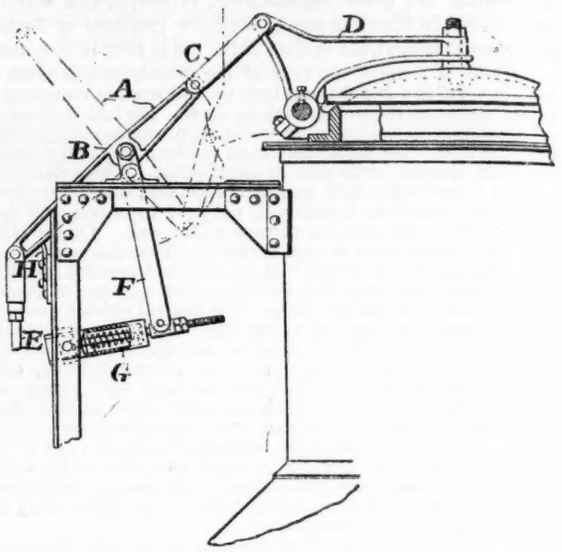
Valve or Closure Mechanism.—No. 177,311.

Humphreys & Glasgow, Ltd., of Victoria Street, S.W., communicated by Chrisman, C. S., of West Chester (Penn.).

No. 2839; Jan. 21, 1921.

The principal objects of this invention are, first to provide for holding the valve seated without reliance upon its weight so that the valve and its operating mechanism may be comparatively light and therefore inexpensive in construction, and capable of quick and economical operation; second, to permit of a substantial reduction in size of any hydraulic cylinder apparatus that may be employed for operating the valve; third, to provide for permitting momentary release in case of a "puff" in the vessel or chamber closed by the valve; fourth, to operate the valve by straight line pull and thrust on a radial line; and fifth, to provide a light, quick-acting, comparatively inexpensive, efficient gas-apparatus stack, purge, or other valve or closure and operating mechanism.

The illustration is a side view, partly in section, of a valve and mechanism embodying the invention. A beam A is pivoted at B and constitutes a toggle-member. A link C is pivotally connected with one end of the beam A, and with one end of the lever D; and this link constitutes the other toggle element. Power is applied to the beam A by means of the connection E, which may be operated by hand gear or by an hydraulic piston and cylinder; and in the latter case the cylinder may be comparatively small, because of the light weight of the valve. It may be remarked that the parts operate in a straight line, which is advantageous in avoiding torsional strains. When it is desired to permit the valve to unseat in the event of a "puff" in the chamber, a spring support or abutment for one of the toggle elements



Chrisman's Closure Apparatus.

is provided. As shown in the illustration, the fulcrum B of the beam is carried by an arm F pivoted to a support, and acted upon by a spring G. Normally the spring tends to shift the pivot point B clockwise in the drawing; and this, in co-action with a stop H, tends to straighten the knuckle of the toggle-joint and seat the lid. A "puff" under the lid unseats it.

Gas Heating for Coal-Fire Ranges.—No. 177,110.

Smith, J. A., of Sunderland.

No. 21,653; Aug. 15, 1921.

This invention comprises tubular burners and means connecting them to a common supply-pipe, secured to a plate adapted to be inserted in the oven of a coal fired range. The burners are provided with a series of outlets for the gas along their upper sides, so that a series of jets of flame will be distributed along their length. Suitable feet or projections are cast on the tubular burners which rest upon the plate in the base of the oven, and lugs are provided by means of which they may be clamped in position.

The ends of the burners are connected by a supply-pipe from which a single pipe provided with a cock passes through a suitable aperture in the face of the oven. When the oven is fitted with an adjustable ventilator, this will probably be sufficient to allow the products of combustion to escape; but if necessary a suitable outlet may be arranged in the back or top of the oven.

Charging Means for Retorts.—No. 177,422.

West, J., of Southport, West's Gas Improvement Company, Ltd., of Manchester, and Wild, W., of Blackpool.

No. 11,191; April 18, 1921.

This invention relates to charging horizontal and inclined retorts, and has for its object to provide an improved arrangement comprising a rotating worm, which shall be particularly applicable for use in connection with continuously operating retorts.

Fig. 1 is a sectional side elevation, and fig. 2 an end elevation of a retort charger constructed in accordance with the invention. A mouthpiece or charging chamber A, which may be made of cast iron, is provided between the end of the retort B and the casing C in which the charging worm D rotates; the mouthpiece being shaped so that at one end it fits upon the elliptical retort and at the other end against the circular worm-casing C. The mouthpiece A is provided with a gas offtake E at its upper end. The worm-casing C is provided with a coal charging connection F at its upper side, and is bolted to the mouthpiece A. The cylindrical part, in which the worm D rotates, is preferably of less vertical height than the interior of the mouthpiece, so that the coal after leaving the worm-casing can move upwards in order to fill the retort, while leaving an empty space in the upper part of the mouthpiece to facilitate the passage of gas to the offtake E. The base of the worm cylinder is in line with the base of the mouthpiece and of the retort, so that the pressure applied to the coal within the retort by the charging worm is exerted mainly at the lower portion of the charge.

The front plate G of the worm-casing carries the worm spindle, the means for taking-up the end thrust thereon, and the spindle rotating mechanism; so that by removing this front plate the worm and all its co-operating parts are withdrawn and a clear way is provided into the retort. For this purpose the front plate G has a bracket H which carries a thrust bearing I for the charging worm spindle J, also a bearing K for the shaft of the worm L which engages a worm wheel M upon the spindle J. This shaft carries a ratchet wheel N which is engaged by a pawl O, an adjustable quadrant-like guard member P being provided in association with the fixed bracket for limiting the operating

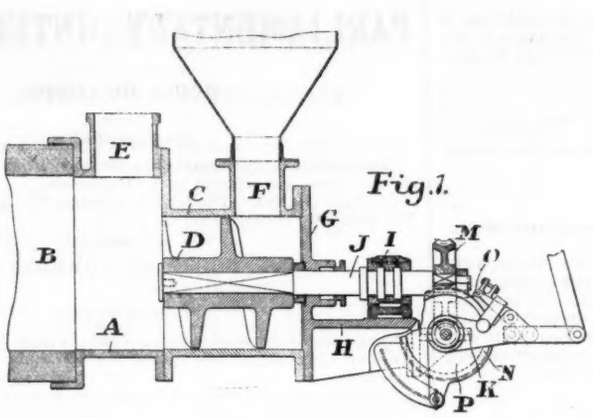


Fig. 1.

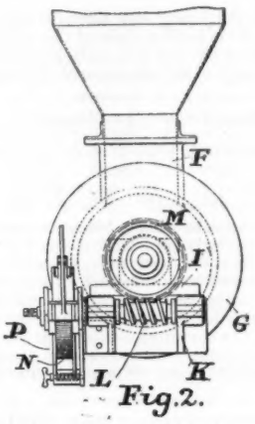


Fig. 2.

West's and Wild's Retort Charger.

portion of the traverse of the pawl so as to vary the rate of rotation of the charging worm D.

The arrangement provides a simple and efficient continuously operating charging means for horizontal or inclined retorts adapted for continuous operation as described in patent No. 113,981.

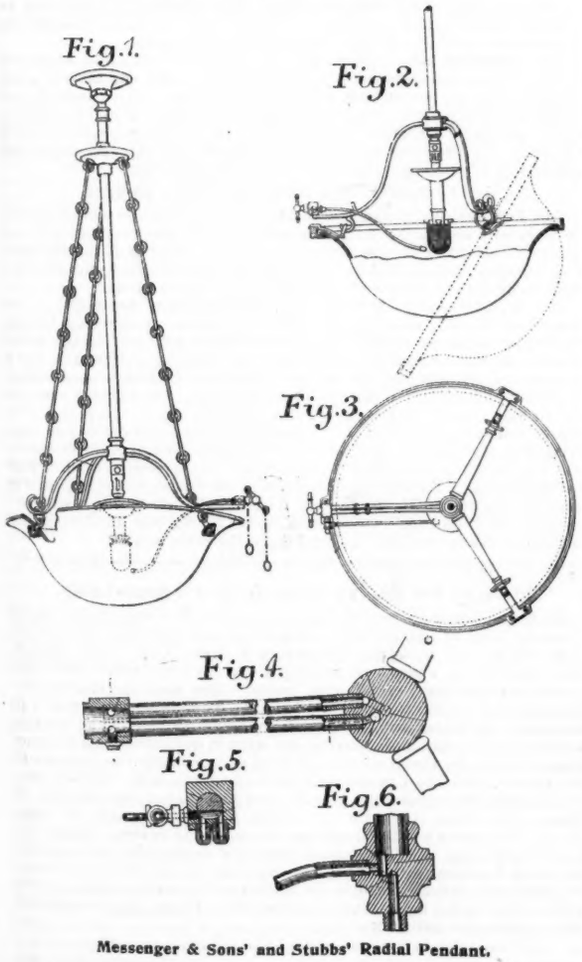
Securing Globes, &c., to Incandescent Burners. No. 177,691.

(Patent of Addition to No. 168,129; May 20, 1920.)

JONES, A. C. (trading as Messenger & Sons, of Birmingham), and STUBBS, S. P., of Birmingham.

No. 8056; March 15, 1921.

This invention has for its object so to construct the radiating and/or depending arm device combined with the burner and from which the globe, shade, or the like is suspended, that it is particularly adapted for use with burners applied to the lower end of a fitting having pendant tubes, and provides for a very convenient position of the tap or cock whereby the supply of gas to the burner is controlled.



Messenger & Sons' and Stubbs' Radial Pendant.

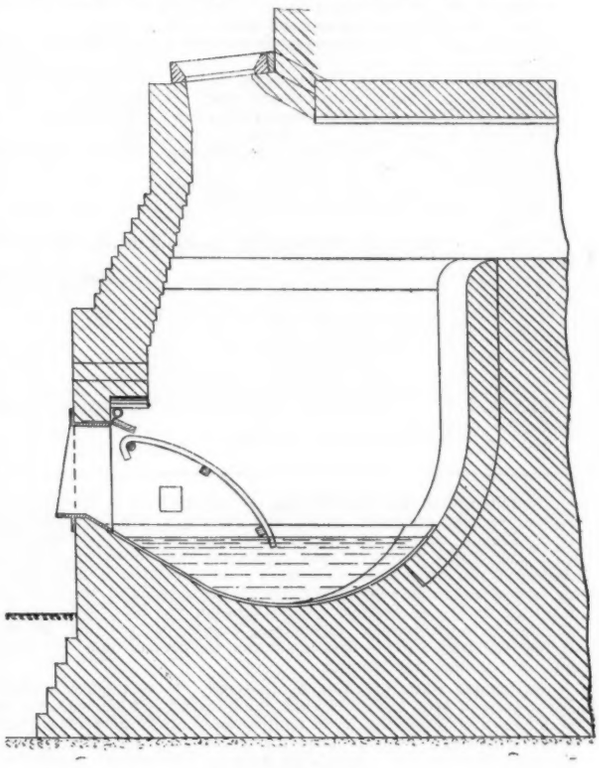
The arrangement is clearly indicated by the drawings reproduced with this notice. Fig. 1 is a part-sectional elevation of a pendant; figs. 2 and 3 are an elevation and plan of a modification; fig. 4 is a plan of the arm which comprises the supply tubes; while figs. 5 and 6 show details of the valve fitting and central boss respectively in which these tubes terminate.

Furnace Grates.—No. 177,830.

SOUTH SUBURBAN GAS COMPANY, of Lower Sydenham, and GORMAN, F. G., of Forest Hill, S.E.

No. 30,928; Nov. 2, 1920.

This invention refers to the design and construction of furnaces for horizontal, inclined, or vertical retort settings, water-gas plants, or any furnace using solid fuel. Firebars of square, round, V, or other sec-



Gorman's Firebars.

tion are designed with a suitable curve as shown in the accompanying illustration. There is a hook by which they are suspended from a round hanger bar, and they are further supported at intervals on square bars built into the brickwork sides. A dip plate with a jet of water is arranged immediately over the top end of the firebars, protecting the bars and preventing the formation of clinker on the front wall of the producer.

The ordinary form of firebars or step grates with flat plates supporting the fuel require to be removed for clinkering the fire, during which operation an amount of good fuel is brought away with the clinker and much time lost during the process. In this grate the bars are designed with a suitable curve, are suspended on a cross bar, and further supported at intervals on square bars built in the brickwork sides. The bars are thus held in position at the upper end, while the lower end can be agitated during the pricking of the fire. This action, combined with the curve, shape, and position of the bars in the furnaces, causes the ash to fall into the water pan below, from which it is raked out at intervals. It is claimed that with this improved form of firebar the fuel travels down through the producer in such a manner that clinker

is not formed and the heavy and wasteful operation of clinkering is done away with. It is further claimed that owing to the shape of the bars, they may be withdrawn and replaced at any time while the producer is at work without unduly disturbing the fire.

Stuffing Boxes for Gas-Meters.—No. 177,463.

SMITH, E. W., and SMITH METERS, LTD., of Kennington Park Road, S E.

No. 22,166; Aug. 20, 1921.

This invention relates to stuffing boxes for the moving parts of gas-meters, and is particularly applicable to the flag rods.

The stuffing box is in two parts only, the upper of which screws on to the lower and is formed integrally with an internal flange, which serves the purposes of dividing the whole of the box into the two compartments, acts as a guide for the spindle or rod passing through the box, and also as a means to compress a washer between the two parts and thereby make a tight joint. The lower part contains ordinary packing material, while the upper part contains vaseline or the like.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 3.]

Nos. 11,407 to 12,102.

BOPP & REUTHER.—"Recording and indicating apparatus for measurements of flow of fluids through orifices and nozzles." No 11472.

CHAMPION, D. L.—"Maximum-recording pressure gauge for gases." No. 11,421.

DAMIENS, A. A. L. J.—"Process for recovery of ethylene in industrial gases for manufacture of alcohol or ether." No. 11,457.

GLOVER, W. R., and GLOVER & CO., LTD., T.—"Atmospheric gas-burners." No. 11,830.

HADDOCK, J.—"System of gas cooling for internal-combustion engines." No. 11,786.

HART, T.—"Tap or stop-cock." No 11,692.

HEAP, W. B.—"Valves and cocks." No. 11,412.

HELPS, G.—"Bunsen burners and grillers." No. 11,535.

HYNE, C. J. C. W.—"Coupling-devices for pipes, taps, &c." No. 11,523.

LOISY, M. C. J. E. DE—See Damiens, A. A. L. J. No. 11,457.

M'EWEN, S.—"Manufacture of coal gas." No. 11,755.

MAJOR, P. F. E.—"Coin-released gas-meters." No. 11,694.

MARRIOTT, L. G.—"Gas, &c., stoves." No. 11,888.

MELDRUMS, LTD—"Apparatus for effecting intimate contact of gases and liquids." No. 12,024.

MILES, G. H.—See Major, P. F. E. No. 11,694.

MÜLLER, H.—"Doors and door frames for retort, &c., ovens." No. 11,970.

PARKS, A.—"Means of controlling flow of liquid through conduits." No. 11,475.

PETTIGREW, G.—"Saturator for continuous production of neutral sulphate of ammonia." No. 11,589.

PIETTI, O. J. G.—See Damiens, A. A. L. J. No. 11,457.

SIMPSON, M.—"Pipe-joints." No. 11,758.

SMITH, C. C.—See Major, P. F. E. No. 11,694.

TULLOCH, T. G.—"Gas-scrubbers." No. 11,438.

UNDERFEED STOKER CO., LTD.—See M'Ewen, S. No. 11,755.

WILTON, T. O.—"Continuous dehydration and distillation of tar, &c." No. 11,486.

WRIGHT, S.—See Meldrums, Ltd. No. 12,024.

Loughborough Gas Undertaking.—A report from a Special Sub-Committee was presented at the last meeting of the Loughborough Town Council, stating that, with regard to expenditure upon maintenance, the works, owing to war conditions, had been unavoidably allowed to fall into a state of disrepair; but the matter is now receiving careful attention, while every effort is being made to keep the expenditure as low as possible. Consideration has been given by the Committee to the question of effecting economies; the total salaries having risen from £407 in 1914 to £1239 at the present time—the latter amount including war bonuses.

Suffocated while Cleaning a Gas-Oven.—At an inquest in York on the body of Mrs. Louisa Horner, the husband said his wife was in weak health, and was subject to fainting fits. He found her lying face downwards with her head partly inside the gas oven. The gas-tap was partially turned on. Inside the oven were deceased's spectacles, a bowl, brush, and soap; and on a newspaper close by were scrapings of grease. He formed the opinion that his wife, while cleaning the inside of the oven, had been seized with a fainting fit and collapsed. In falling, she must have accidentally turned on the tap, which had been in use for fourteen years, and was very loose. The verdict was that Mrs. Horner had been accidentally suffocated while cleaning the oven.

Lincoln Gas Prices.—A strong feeling in favour of the reduction of prices at present charged for gas at Lincoln found expression at a meeting of the City Council last week, when Mr. J. J. Smalley urged that it was time an alteration was made. He pointed to the fact that in Nottingham it was stated to be the intention to diminish the rate charged per 1000 c.ft., and suggested that, as wages of workmen had been considerably reduced, there ought to be a lowering of the price. In reply, the Chairman of the Committee (Alderman T. Wallis) said that, if the Committee had not raised the price, it could not be expected that it could be lowered. During the coal strike the Committee expended about £5000 in trying to get consumers "a bit of light to go on with," while some places in the country were in darkness. There had been other heavy expenses, and it was no use reducing the price now, and so get into debt.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Birmingham Corporation Bill: Brought from the Commons, read the first time, and referred to the Examiners.

Sheffield Gas Bill: The further Standing Orders applicable to this Bill have been complied with.

HOUSE OF COMMONS.

Progress of Bills.

Birmingham Corporation Bill: Read the third time, and passed.

Bolton Corporation Bill: Read the first time, and referred to the Examiners.

The Chairman of Ways and Means, the Deputy Chairman, Colonel Sir Alan Sykes, Mr. George Thorne, and Sir Ernest Moon, have been appointed as a Committee to consider the Stoke-on-Trent Corporation (Gas Consolidation) Bill; to meet to-day (Wednesday).

Gas Regulation Act.

A copy was presented of a Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Coatbridge Gas Company.

Subscriptions to Organizations.

Mr. Trevelyan Thomson has given notice of an amendment to the Audit (Local Authorities, &c.) Bill which provides that the corporation of any borough whose accounts are audited by district auditors may out of the borough fund pay reasonable subscriptions, whether annually or otherwise, to the funds of any association of municipal corporations or other local authorities or their officers formed for the purpose of consultation as to their common interests, and the discussion of matters relating to local government, and any reasonable expenses of the attendance of any members or officers of the corporation, not exceeding in any case four, at conferences or meetings of the association, or any of them, and of purchasing reports of the proceedings of any such conferences or meetings.

Carbon Monoxide Poisoning.

Sir R. CLOUGH asked the Minister of Health whether his attention had been called to the frequent cases of poisoning by carbon monoxide gas; whether he had seen the statement that this was apparently due to the new type of gas manufactured; and whether, in any event, he would investigate the frequency of these cases so as to reassure the public and avoid, if possible, any further recurrence.

Mr. BALDWIN, who replied, said the Board of Trade had appointed a Special Committee to investigate this subject, and had already given effect to the recommendations of the Committee. All cases of fatal accidents attributable to gas poisoning were reported to the Department, and reports thereon were made to them by the medical officers of health. There had not been any marked change recently in the proportion of water gas supplied by gas undertakings.

Gas Companies' Dividends and Therm Charges.

Mr. LYLE asked the Minister of Health if his advisers were now able to make any statement on the financial effect to the public of the new system of charging for gas according to therms instead of the old cubic feet capacity; whether the gas companies had benefited enormously; and whether the results corresponded to his expectations.

Sir W. MITCHELL-THOMSON (the Parliamentary Secretary to the Board of Trade), who replied, said the system of charging for gas according to therms ensured that the consumer only paid for the actual number of heat units contained in the gas supplied to him, and was a measure of protection to the public. There was no financial advantage to the suppliers of gas in this method of charging. Any such advantage which had accrued to gas companies was due not to charging by the therm, but to the fact that their standard or maximum prices had been revised in compliance with the Gas Regulation Act, 1920, with the result that in many cases their dividends now approximated to those paid before the war. At the same time, where the sliding-scale had been in abeyance owing to war conditions, it had again been put in operation; so that the dividends would once more be subject to fluctuations according to any reduction or increase in the price of gas.

Liability for Falling Glass from a Street-Lamp.

An action heard at the Cardiff County Court last Wednesday turned upon the point of liability for personal injuries sustained by a pedestrian and caused by falling glass from a street-lamp. The plaintiff, Mrs. Mary Elsie Vokes, was passing along the street when glass from a lamp fell and cut her left foot badly. She sued the Cardiff Corporation and the Salvation Army, as joint defendants, to recover £40 damages; the latter being made defendants on account of the fact that attached to the standard carrying the lamp in question was a streamer banner put up by them. This had been done without the sanction of the police; and the Corporation therefore disclaimed liability, contending that the banner in a gale of wind had caused the standard to vibrate more than it should have done, and thus brought the lamp down. The lamp was fitted with an anti-vibration device. Judge Hill Kelly found that the Corporation were not responsible, and entered judgment for them with costs. He said that the anti-vibration device was made insufficient through the additional vibration caused by the wind acting on the banner, and awarded Mrs. Vokes £25 damages and costs against the Salvation Army.

The price of gas at Croston is to be reduced by 6d. per 1000 c.ft., with a discount of 3d. to ordinary consumers and of 6d. for commercial users. The new charges operate from the March quarter.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Ordinary General Meeting of the Association was held on Tuesday of last week, at the Cannon Street Hotel, E.C.—Sir CHARLES J. JESSEL, Bart., in the chair.

The SECRETARY (Mr. F. H. James) read the notice convening the meeting; and the seal was affixed to the register of proprietors.

The CHAIRMAN: I now formally move—

That the interim dividend at the rate of 3 p.ct., less tax, paid in respect of the half year to June 30, 1921, be hereby confirmed.

The DEPUTY-CHAIRMAN (Col. H. Le Roy-Lewis, C.B., C.M.G., D.S.O.) seconded the motion, which was unanimously agreed to.

The CHAIRMAN then called upon the Secretary to read the Auditors' certificate.

This having been done,

The CHAIRMAN moved that the accounts for the year 1921, and with them the report, be taken as read; and this also was agreed to.

PROFIT AVAILABLE FOR DIVIDEND.

The CHAIRMAN next called upon the Secretary to read the scheme prepared in accordance with the Companies' Clauses Consolidation Act, showing the profit applicable to the purposes of dividend, and the proposed division.

The SECRETARY read the scheme, as follows:

Year ended Dec. 31, 1921.

Scheme for the division of profits available for appropriation.

Profits available, after deduction of the amount appropriated for the 3 p.ct. interim dividend paid on Nov. 15, 1921, as per balance-sheet .	£116,824	0	0
Add: Income-tax at 6s. in the £, which will be deducted from the final dividend of 7 p.ct. for the year	41,495	4	5
Total available for appropriation . . .	£158,319	4	5
Final dividend of 7 p.ct. for the year ended Dec. 31, 1921 (payable less income-tax at 6s. in the £ on May 15, 1922), on the £1,976,000 capital stock, such dividend to be paid upon the holdings standing in the books of the Association on April 18, 1922, when the Transfer Books were closed (gross)	£138,320	9	4
Balance carried forward to next account . . .	19,998	15	1
Total, as above, appropriated	£158,319	4	5

MR. ROBERT WILSON ON THE BOARD.

The CHAIRMAN: Ladies and gentlemen,—It will doubtless come somewhat as a shock to those of the proprietors who are of long-standing in this Association, as it does to me, to hear somebody else than Robert William Wilson called upon as Secretary to read the notice convening this meeting, and to do the other things which the Secretary has to do. Mr. Wilson, after fifty years' service with the Association, twenty-six of which have been spent—and brilliantly and ably spent—in the office of Secretary, has resigned. You have doubtless heard me allude year by year to the various services he has been able to render to this Association. His long career as Secretary was finally crowned by his able conduct of the negotiations in Berlin last November, of which I shall have more to say presently. I am glad to think that I need not in any way allude to Mr. Wilson as a "back number," because we have been able, through a vacancy that occurred in our ranks, to elect him to the Board [applause]; and therefore we shall still have full advantage of his long experience in the service of the Association.

THE LATE SIR ARTHUR LUCAS.

I have referred to a vacancy that occurred on our Board; and that vacancy was occasioned by the lamented death of my old friend and colleague Sir Arthur Lucas, who had been a Director ever since June, 1880. He died in January of this year; so that he had been a Director for no less than forty-two years, for eighteen of which he was Deputy-Chairman. He resigned from the position of Deputy-Chairman last May, and was succeeded by Col. Le Roy-Lewis. I can only say this of Sir Arthur Lucas—that we deeply regret his loss. He was a man who could always take the point of view of an Englishman and of a gentleman; and he began his City career, like others of my colleagues have done, as a Director of this Association. Up to the very last—only a few days before his death, when I saw him—he took the keenest interest in our doings.

THE OUTSTANDING BALANCE OF THE ASSOCIATION'S CLAIMS.

Now, ladies and gentlemen, before I deal, as I propose to do, with the accounts you have before you, I should just like to say a word or two with reference to the position of the outstanding balance of the Association's claims under the Peace Treaty, in respect of its German properties, rights, and interests. Since our meeting last year, considerable progress has been made towards reaching a final settlement of these claims, the credit for which I have already given—or a good deal of the credit, at least—to our late Secretary, Mr. Wilson, for his successful handling of the negotiations at the conference held in Berlin in November last. As the proprietors are aware, the Board have left no stone unturned in their endeavours to speed-up the settlement of our claims in a manner satisfactory to the Association; and, as a result of their repeated representations to the British Clearing Office, it was suggested towards the end of the summer of last year that an empowered representative of the Association should proceed to Berlin to discuss the claims with the representatives of the British and German Clearing Offices there. After considerable correspondence, the German Minister for Commerce and Industry appointed Nov. 14 for the joint conference. Mr. Wilson and our Accountant, Mr. Jackson, accordingly proceeded to Berlin, and on the appointed day thrashed out the items in dispute one by one. On the second day of the conference an agreement was reached at a figure of £1,600,000. This sum included £50,000 in respect of expenses deducted by the Liquidator, which Mr. Wilson had successfully argued should not be charged against the Association. Mr. Wilson was assured by the representative of the British Clearing Office in Berlin that the Association was well advised to accept the above-mentioned sum. Naturally enough, we should have been glad to settle at a higher figure; but more, I am convinced, was absolutely unobtainable. In view of the conditions obtaining in German industry, we can, I think, consider ourselves very well out of things at the price. The £50,000 being a claim for actual proceeds of liquidation became due immediately upon admission by the German authorities; and a cheque for £49,750 (£50,000, less ½ p.ct. commission due to the Clearing Office) was received from the British Clearing Office on March 1 last.

PRESENT POSITION.

With regard to the balance of £1,550,000, it was necessary in the first place to obtain the formal judgment of the Mixed Arbitral Tribunal. On March 31 the Clearing Office notified us that this formal judgment had been given, so that the Association is no longer a claimant, but a creditor for that amount under Article 297 (*e*) of the Peace Treaty. As regards payment of this sum, the Clearing Office state that claims under Article 296 in respect of pre-war debts, and those under Article 297 in respect of actual proceeds of liquidation, have to be given priority over claims for compensation under Article 297 (*e*) in respect of inadequacy of the price realized by the Liquidator, and that, consequently, until it is established that the assets and funds available will be sufficient for securing payment in full of these priority claims, the Clearing Office is not in a position to make any payments on settlements such as ours. Unofficially, the Association have heard that there would appear to be ample funds to cover payments for compensation after meeting the priority claims, but that it was impossible to state at present upon what date payment could be expected. The effect of the compromise is not shown in the balance-sheet before you, as on Dec. 31 last matters were not sufficiently advanced to allow the agreement to be regarded as absolutely binding. The Association still have outstanding claims to the extent of £7162 1s. 5d. under Article 296 of the Peace Treaty, in respect of pre-war debts.

ANTWERP AND BRUSSELS STATIONS.

During the course of the war, the German authorities sold our Antwerp and Brussels establishments to a German Company, and paid the registration fees out of the Association's cash. A claim was lodged for the restitution of the amount—*i.e.*, 1,461,938 frs.—but the German authorities successfully upheld that, as the fees were paid to the Belgian Registration Office, the claim must lie against the Belgian authorities. The Belgian authorities have admitted the debt; but as special sanction has to be obtained from Parliament, the repayment has not yet taken place. The claim in respect of the Antwerp and Brussels stations for gas consumed, requisitions, &c., made during the war by the Germans is now being examined and pruned by the British Commissioner in Belgium. The British Government are setting aside for purposes of compensation the sum of £5,000,000 out of the Reparation Funds to be received from Germany. I may add that the sum of £5,000,000 is totally inadequate to cover the claims which fall to be dealt with under it—claims in respect of the destruction by enemy hands of British life and property, for which in the main, owing to errors in drafting, no provision has been made in the Treaty itself. It is to be hoped that the Chancellor of the Exchequer will eventually see his way to be more generous in the matter, and set aside a larger sum for the purpose, as it must not be forgotten that many of these claimants have lost practically their all, and that their only hope of compensation lies with the British Government.

THE AUSTRIAN CLAIMS.

As regards our Austrian claims, we ascertained that there was little (if any) hope of the full restoration at the pre-war rate of exchange of the Association's cash assets, which were invested by the Austrian Controller in Austrian War Loan. Also that, even if an award for partial settlement were made by the Mixed Arbitral Tribunal, it was absolutely impossible to foresee whether or when payment would ever be made. It was therefore decided to enter into negotiations through the British Clearing Office, in order to effect a definite settlement in currency, rather than a problematical one in sterling. These negotiations are still in progress.

THE ANTWERP CONTRACT.

That is all I have got to say about the claims; and now I will go through the accounts. In the right-hand side top corner of the profit and loss account, there appears the item "Net profit from stations, £209,685." I would only say here that this shows perhaps satisfactory progress; but we hope for still better things in another year. With regard to Antwerp, you will remember that when I spoke to you last May we were in the throes of a settlement with them in respect to the prolongation of our contract. It was prolonged finally for five years, to 1932, through the able management of our Agent (Mr. Van den Abeele) and our Manager (Mr. A. F. P. Hayman); and the remainder of our contracts at Antwerp have been prolonged in accordance with this settlement. We have now six concessions there which expire in 1932, which includes the main one of Antwerp itself. We have fourteen which expire in 1940; and we have another thirty-six which expire at various dates between 1950 and 1954.

THE POSITION AT BRUSSELS AND FLUSHING.

I regret to say, with respect to Brussels, that we have not been quite so fortunate. Brussels is rather a difficult job; but we are always hoping, and we are still in the hoping stage of being able to place things at Brussels in a more comfortable state. Flushing has done somewhat better, and has actually been able to show a profit; and a small profit when translated into sterling has been earned at Prague and our other stations in Czecho-Slovakia.

DIVIDENDS ON INVESTMENTS.

Coming to dividends on investments (£199,814), these are, of course

abnormally large. You will remember that during the early part of the year we paid away, in the shape of a 20 p.ct. dividend, and in return of debenture capital and capital stock, £4,700,000. We received this money in December, 1920, and did not distribute it until several months afterwards. It happened to be paid to us at a time when money could be temporarily invested at a very remunerative rate of interest; and you must consider £57,000 out of the sum put down in the accounts as due to our being able so to use the money which was subsequently distributed among the proprietors. I would also say that our proprietors were exceedingly kind to us. A good many of them did not pay the slightest heed to our notices. Some destroyed them, and others lost them. There were careless trustees who said they had never received them; and it took a very long time before some of this money reached the proper quarter. At the time of the making-up of the balance-sheet, there was still about £37,000 outstanding; but as the result of continually going on sending out notices, I believe at the present moment there is only about £20,000 outstanding. At any rate, we are very much obliged to the proprietors for so kindly leaving their money with us for such a long time. I must warn you about one thing. In this return from investments there is an item of £34,000 odd from the Compagnie Continentale du Gaz en France. That Company during 1920 were financially in a very hard-up condition. I am glad, however, to say that things are very different now. But though they declared a dividend in October, 1920, they did not credit us with it until 1921; and therefore the dividend for 1920 of £34,000 odd appears in our accounts on this occasion. On the other hand, I may say that during the year—and their year begins differently from ours—from July, 1920, to June, 1921, they did not pay a dividend at all. Probably, however, the Compagnie Continentale will declare a very good dividend for the year now current. Being in a very fine financial state, they should be able not only to declare but to pay it in the current year, and so I hope our accounts will not suffer. As showing their improved financial condition, I may say that at one time they owed us about 6,000,000 frs., and they have paid the whole of this off. However, though "Peter" has been able to pay us his debt, I am sorry to say that "Paul," in the shape of the Société Lilloise, has been forced to borrow from us, and at the present owes us some 4,000,000 frs. I still regard this asset as one of the most valuable we have; and I am glad to say their profits are improving month by month. They will be able to declare for the current year a very handsome dividend; and so all will be well. I need hardly dwell upon the small amount of the rent of the sub-basement at No. 6, London Wall. This is a new item which arises from the removal of our offices. On the other side of the account, you will see that expenses in London, &c., are down as compared with the previous year by about £9000. That is almost entirely due to our having taken up a more humble abode, in the shape of No. 6, London Wall, in place of No. 21, Austin Friars, thereby decreasing our expenditure. There will be more to come off this year, because for one quarter we were in our old premises. Income-tax and corporation profits tax I need not dwell upon. Interest on debenture stock will be in future a little down, to £14,000, because we were still paying on the larger amount. The item of amortization of concessions (£62,438) speaks for itself. With regard to the exchange account, this amounts to the large sum of £83,000, entirely due to having to write-down our German assets. We were obliged, of course, to take the sum at which the mark stood on Dec. 31; and I am sorry to say that the mark has depreciated still further since then. Therefore there will be some further loss on exchange during the current year. Depreciation of plant and investments written-off, £21,696, refers almost entirely to plant. The legal expenses in connection with claims against Germany, it is not necessary to dwell upon; and the same with expenses in connection with return of capital.

THE BALANCE-SHEET.

Coming to the balance-sheet, under assets, works and mains are up by about £43,000. We spent on capital account some £126,000, and we wrote-off about £21,000, because part of this capital had been spent on things likely to last only a very few years. And besides this there was the amortization figure which I have already given of £62,438. The difference between the £21,000 written-off, *plus* amortization of £62,000, and the £126,000 is the £43,000 I have named. Freehold land forming the sites of works has gone up some £1000 or so, on account of a small plot of land which we purchased at Antwerp. Stocks at stations speak for themselves. They are all taken at the exchange on Dec. 31 last. Cash at stations and at bank calls for no special reference. Sundry debtors are £200,000. Of course, the difference between this and the previous year is because at the former time the Clearing Office were owing us £885,368, which they have since paid. Loans to foreign gas and electricity companies, &c. (£56,035), are down about £100,000. This is principally due to the etceteras, as £104,000 outstanding on loan in London on Dec. 31, 1920, has since been repaid. In connection with freehold property in London and abroad, we have written-down No. 6, London Wall. We bought it at the height of the boom, and thought we would write it down, and all the expenses attached to it. The reserve fund remains where it was. The pension fund investments (£347,095) we have increased by £100,000, so as to get the fund a little nearer to what it should produce in order to pay our pensions. This £100,000 is due to the profit made on the difference between the book value and the sale price of Austin Friars. We simply took £100,000 out of that, and put it to the pension fund. In this fund, £100,000 5½ p.ct. Treasury bonds are valued at only £93,913. I spoke to our Accountant about this, because it seemed rather ridiculous, as to-day they are quoted at 111 p.ct.; but he said that was all that they cost us. I need not say much about the item of English, Colonial, and Indian securities, because all the amounts I have already spoken to you about which we temporarily had on Dec. 31, 1921, have now gone into the pockets of the proprietors and debenture holders. The item of foreign gas and electricity companies (£621,742) remains about the same; the largest item being the Compagnie Continentale du Gaz. We have about 33,000,000 frs. in this, which represents some £600,000 written-down. There is a very fine hidden reserve there, as the franc goes up in value. On the other side, I do not think there is any item that I need call attention to until we get to sundry creditors (£214,591). We were owing last year a very large sum of money for income-tax, which has since been settled. Of the sum of £214,591, the stations are responsible for about £80,000, and we owed about £40,000 for income-tax. We also have paid no corporation tax yet. We shall have to pay it in a very few weeks now; and £20,000 has been allowed for this. I do not think there is anything else I need draw your attention to in the accounts; but if proprietors wish to put any questions to me in respect of any item on which I have not satisfied them, I shall be very pleased to answer them. I will now move:

> That a final dividend of 7 p.ct., less income-tax at 6s. in the pound, be declared on the £1,976,000 capital stock of the Association in respect of the year ended on the 31st of December last, such dividend to be payable on and after the 15th of May, 1922, *pro rata*, upon the holdings standing in the books of the Association on the 18th of April, 1922.

Col. Le Roy-Lewis seconded the motion.

Mr. Whitworth asked what had been actually received from the sale of the Frankfort works some time ago. They were sold at the beginning of the war for a sum of money to be paid in German marks.

The Chairman replied that the amount received in one way and another was about 18,000,000 marks. They had got at the present moment in Berlin between 19,000,000 and 20,000,000 marks; but he could not say offhand for exactly how much of this Frankfort was responsible. This 20 million marks appeared among the assets. The actual rate of exchange at which it was taken was 768 marks to the pound.

A Proprietor inquired whether the trouble in Antwerp and Brussels as to prices had been settled.

The Chairman answered that the question in Antwerp was settled as long ago as last year. At Brussels there was a certain amount of litigation.

Mr. H. L. Grant referred to a statement in "The Times" some time back, to the effect that when the £1,600,000 was received from Germany, a distribution of £50 on every £100 of capital stock would likely be made as a bonus to holders. Did this, he asked, emanate from the Company?

The Chairman replied that it was not an official announcement from the Company. The reason why the Directors could not tell the proprietors anything about this amount was simply that they did not know. He made it perfectly clear that this £1,600,000 had nothing to do with the capital of the Association itself. It formed a capital profit, just in the same way that when the Association realized a profit on Austin Friars, nobody suggested that it should be used for the redemption of debenture stock. The present capital of the Association was as low as it could possibly be, in view of the assets of the undertaking, and would not be reduced.

A number of questions were then asked with reference to items in the accounts.

Mr. Marshall said that as a proprietor in the Association, he would like to convey to the Chairman and his fellow Directors thanks for the report that had been submitted. He hoped they would do as well in the current year as they did in the past year.

The Chairman, in reply to a further question, said he was not going to disclose what had been done with respect to providing for Mr. Wilson; but the proprietors might be assured that it was impossible to recompense him adequately for the services he had rendered to the Association. As far as they could do so from the financial point of view, he could only say he was sure that, if the proprietors heard the figure, they would be perfectly convinced that Mr. Wilson had been suitably compensated. He would further like to say that when war broke out Mr. Wilson's salary was reduced; and it redounded greatly to his credit, because under the pension scheme he could have retired as a pensioner (but did not) on a far bigger sum per annum than he was getting as Secretary to the Association. ["Hear, hear."]

Mr. Wilson: I should like to assure you that I am more than satisfied with what the Directors have done.

The Chairman added that he had every hope that this year their profits would be quite as good as (if they did not exceed) those of the year now under review.

The resolution was then put, and unanimously carried.

The Scheme for the Appropriation of Profits.

The Chairman then moved that the accounts, together with the Scheme for the Appropriation of Profits (as read by the Secretary) be received, adopted, and entered upon the minutes of the meeting.

Col. Le Roy-Lewis seconded this; and it was agreed to.

Re-Elections.

The Chairman said he had great pleasure in moving that Sir Henry Birchenough, Bart., K.C.M.G., who was the next senior Director to himself, and had been a valued member of the Board for many years, be re-elected a Director of the Association. He also begged to move the re-election as Directors of Mr. H. G. Newton (who had been a long time on the Board) and Col. H. Le Roy-Lewis (their valuable Deputy-Chairman).

Mr. H. G. Palmer seconded the proposal, which was unanimously passed.

The re-election as an Auditor of Mr. T. B. Bassett was likewise agreed to.

A vote of thanks to the Chairman and Directors concluded the proceedings.

Further Plant for Hereford.—A report by the Gas Committee of the Hereford City Council recommends that application be made to the Minister of Health for sanction to borrow £12,000 for the purpose of carrying out a scheme for meeting the urgent need for further gas-making plant, and that, conditionally on sanction being received, a contract be entered into with Messrs. Humphreys and Glasgow, Ltd., of London, to erect a water-gas plant, a waste-heat boiler, and a steel oil-storage tank, for the sum of £8282. The Committee add that no part of the cost of the scheme will come upon the rates. The improved and economical method of manufacture will more than cover instalments and payment of interest

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

Bordon and District Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 10d. per therm.

Peterborough Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 1·7d per therm.

Westhoughton Consumers' Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. per therm.

DECLARATIONS OF CALORIFIC VALUE.

Aberystwyth Gas Company.—425 B.Th.U. (July 1.)
Kildwick Parish Gas Company.—500 B.Th.U. (June 30.)
South Bank and Normanby Gas Light and Coke Company, Ltd.—400 B.Th.U. (July 1.)
Stourport Gas Company.—450 B.Th.U. (June 25.)
Truro Gas Company.—450 B.Th.U. (July 1.)

GAS REGULATION ACT ORDERS.

There have been received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Bath Gas Light and Coke Company.

As from the declared date, the price of 12d. per therm shall be substituted for the price of 3s. 9d. per 1000 c.ft. mentioned in section 6 (price of gas within limits of Act of 1856) of the Bath Gas Act, 1865; and the price of 16·2d. per therm shall be substituted for the price of 5s. 6d. per 1000 c.ft. mentioned in section 8 (price of gas in extended limits) of that Act. (April 29.)

Brynmawr and Blaina Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17·6d. per therm. (May 3.)

Chester-le-Street Gas Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 12·2d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-two-fifths. (April 29)

City of Durham Gas Company.

As from the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 12 6d. and 14·6d. per therm; and these prices respectively shall be substituted for the prices of 4s. and 5s. per 1000 c.ft. mentioned in section 47 (limiting the price of gas) of the Durham Gas Act, 1873. (May 3.)

Neath Corporation.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16 6d. per therm. (May 2.)

Twyford (Berks.) Consumers' Gas Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm; and this price shall be substituted for the price of 5s. per 1000 c.ft. wherever it occurs in section 26 (price of gas) of the Twyford (Berks.) Gas Order, 1907.

As from the declared date, "therm" shall be substituted for "1000 c.ft.," and the words "fifth of a penny" shall be substituted for the word "penny" wherever it occurs in paragraph (2) of Schedule B to the Twyford (Berks.) Gas Order, 1907. (April 27.)

Dublin Lighting Estimates.—On further consideration by the Dublin Corporation of the estimates for the ensuing twelve months, the amendment which had been moved on a previous day (when the meeting was "counted out") to reduce the estimate for public lighting by £5000 was defeated by the casting-vote of Lord Mayor O'Neill, who said he did not wish to have the city in darkness. Another amendment to delete £1200 for the lighting of Hermston district was carried. The estimate, as amended, was then agreed to. The original figure was £67,287, as against £48,204 last year.

Cost of a Site for Gas-Works.—The Official Arbiter for Scotland has decided upon the sum to be paid by the Dumbarton Corporation for land taken as a site for their new gas-works. The award is £2350. The sum of £4600 had been claimed; while the Corporation had offered £2000 in full. A claim for £250, in respect that a certain piece of land intended for tenements would be depreciated by reason of the proximity of the new works was not allowed. The Official Arbiter stated that when a district had been set apart for industrial purposes, it was hardly possible to differentiate between one industry and another. Smoke nuisance could be greatly overcome, if not cured, by installing modern plant; and smell could be lessened in the same way. The Arbiter decided that each side should pay its own expenses, and each one half of the Treasury fee.

NOTTINGHAM GAS PROFITS AND RATE AID.

In continuation of a long sequence of annual grants, the Nottingham ratepayers are again this year to be indebted to the gas undertaking for a substantial alleviation of local burdens; it being now proposed to allocate from profits £30,000 in relief of the district rate. This is the same amount as that which has been similarly voted in each of the five preceding annual periods; the high-water mark in regard to such grants having been maintained at £39,000 for each of the years from 1912 to 1915. The amount dropped to £35,000 in 1916, preceding the period in which what has now come to be regarded apparently as the accepted annual standard of £30,000 was brought into operation. Thus it will be seen that, in the eleven years from 1912 to 1922 inclusive, the undertaking will have been responsible for assisting in the reduction of rates by no less an aggregate than £371,000.

Critics of the arrangement have urged that the maintenance of inordinate prices has alone rendered this process possible, and that in essence it imposes a double burden upon ratepayers who are consumers of gas, to the manifest advantage of those who are not participants in its use. But apart from the logic involved in such reasoning, it goes without saying almost that the aid which the undertaking has been able to afford has been heartily welcomed by the general body of ratepayers, and at no period more than the present, when the other trading concerns of the Corporation find themselves unable to contribute anything to the relief of an over-burdened municipal exchequer. On the other hand, the view is being emphasized that the maintenance of the present high charges for gas is no longer justifiable. A substantial reduction was decided upon at a meeting of the Committee last Friday, when it was determined to reduce the price by 4d. per 1000 c. ft., to take effect from June 25; and it has become obvious that this salutary process must not only be expedited but extended, if hopes are to be realized of attracting to the city the new industries of which Nottingham stands sadly in need. Meanwhile, thanks largely to the continued help of the Gas Committee and a drastic reduction of expenditure in certain other departments of Corporation activity, the Finance Committee find themselves in the position of being able to recommend a reduction in the municipal rate for the ensuing year of 1s. 2d. in the pound, bringing it down to 11s. 6d. It has been suggested that there might be a possibility of still further lessening the amount by economizing on the lighting of the public streets, in connection with which an increased expenditure of £7000 is anticipated in the ensuing twelve months, making the total outlay upon this head £32,800; but Nottingham's street illumination had, through a continuance of parsimonious policy, been allowed to degenerate into such an unsatisfactory condition that any return to a miserable attenuation of necessary lighting would, it is felt, be undesirable. There is, it has been suggested, plenty of room for improvement upon even the present system of street illumination, which might possibly best be effected by a standardizing of lamps.

REDUCTION IN PRICE AT SALFORD.

The Absence of a Reserve Fund.

Alderman Phillips (the Chairman of the Gas Committee) proposed at last Wednesday's meeting of the Salford Town Council the adoption of a resolution of that Committee recommending that after June 30 the price of gas to all consumers by ordinary meter in the area of supply be reduced by 6d. per 1000 c.ft., and that the quantity of gas supplied for a penny by prepayment meters be correspondingly increased from 16·7 to 18·29 c.ft. The reduction was, he said, proposed at the earliest possible moment. It was common knowledge that the difficulties of the Committee, like those of many other gas undertakings, had been serious. The cost of coal had been enormous. Prices had been getting easier recently; but those who had urged the reduction of the price of gas had seemed to forget the strenuous times they had gone through. There had been a great coal strike; and they had had to get by hook or by crook a considerable supply of coal to keep the gas service going. They had maintained a full and unrestricted supply during the strike period; but it had been at considerable expense, and they had had to sell gas at about one-half what it had cost. The end of the strike found them with a deficit of £30,000. They had been dependent to a considerable extent on the sale of residuals; and these, with other things, were coming down. It was expected that this year there would be a loss under these heads of nearly £50,000—perhaps more. Owing to the policy of the Corporation, this large gas undertaking had not a halfpenny of reserve fund, though it was an absolute necessity, not a luxury. Comparisons had been made with other undertakings, one of which had nearly £200,000 of reserve. The Committee had protested, as he had done for years, against this policy. They were in the position of having to subscribe in relief of rates £12,090 a year, whether they made it or not; and there had been years when they had not. They had, however, been getting remissions in bonuses and the price of materials; and taking a broad view of the situation, observing the great amount of unemployment, flagging industry, and very high rates, the Committee made the present proposal. It would take a long time to reduce their deficit, but they saw their way to it, and therefore asked the Council to consent to the reduction in the price of gas.

Mr. Greenwood said he would have been glad to see a reduction of 1s. per 1000 c.ft. in the price of gas; and he thought a reduction of 6d. might have been made for the January quarter of this year, to be followed by another reduction during the year. He moved as an amendment that the price be reduced 9d. per 1000 c.ft.

The amendment was lost by an overwhelming majority; and the original resolution was then adopted.

No Dividend at Conisborough.—At the annual meeting of the Conisborough Gas Company last Thursday week, it was reported that no profit had been made during the year, and that no dividend would therefore be paid

EAST HULL GAS COMPANY'S CAPITAL.

The Town Clerk has reported to the Hull Corporation Parliamentary Committee that the East Hull Gas Company have applied to the Board of Trade for a Special Order to enable them to acquire further lands and to raise additional capital to the extent of £150,000. He and the Water and Gas Engineer desired to call the attention of the Committee to the following points:

1.—The amount of capital the Company desired to obtain power to raise. Under the East Hull Gas Act, 1906, the Company obtained power to raise £65,000. It was for the Committee to consider whether it was advisable for the Company to be empowered to raise so much as £150,000.

2.—The amount of additional loan capital, power to raise which is now asked for, is £50,000. The Committee would probably agree that the amount of loan capital authorized should not exceed one-third of the amount of ordinary capital authorized, whatever that may ultimately be.

3.—Under the Order, the Company would be empowered, with the consent of the Board of Trade, to offer for subscription by the public any part of the additional capital authorized by the Order, and to pay a commission not exceeding 5 p.ct. to any person in consideration of his subscribing or procuring subscriptions. The result of this clause would in practice apparently be to wipe-out as to any new capital the obligation resting upon the Company under the East Hull Gas Act, 1906, to offer any new issue for sale by public auction or by tender. The Committee should now consider whether the protection thus offered to the public should not continue to exist as to the new capital, notwithstanding the fact that the further power to offer stock can only be exercised with the consent of the Board of Trade.

4.—The Order imposes a limit of dividend of 8 p.ct. on ordinary additional capital, and a maximum rate of 7½ p.ct. on loan capital. The figure in the 1906 Act was 5 p.ct. It is a matter for consideration whether it is in the public interest that the maximum limitation should be so high as now proposed.

The Town Clerk was authorized to lodge objections to the Draft Special Order to confer further powers on the Company, so far as the amounts of fresh capital, the limits of dividend and interest, and the proposed method of raising fresh capital are concerned.

NELSON GAS UNDERTAKING.

The Year's Working—A Reduction in Price.

Consumers at Nelson have received the gratifying information that, as from the beginning of April, their gas is costing them 6d. per 1000 c.ft. less, in spite of the fact that there has been a net deficiency of £5657 on the past year's working. It is pointed out that, had it not been for extraordinary expenditure, which caused the department to spend £24,804 15s. 5d. more than estimated, a greater reduction than this 6d. might have resulted, for the income was £8323 more than estimated. The amount which the Corporation have had to pay for coal shows an increase of £21,000 above the estimated cost, £12,000 of which was directly due to the high cost of foreign coal purchased during the coal strike. This coal was inferior to that which the Corporation had been accustomed to receive; and the yield of gas per ton was much smaller. "Considering all the difficulties that have had to be surmounted," says the local "Leader," "the Engineer and General Manager (Mr. James Mitchell) is entitled to great credit for a successful year's working. If he can succeed in the coming year in making a profit which may help to the reduction of the rates, he will have a town's benediction. Rates were never so difficult to meet as to-day."

In his annual report upon the work done and the results obtained in the Gas Department during the year ended March 31—it is the third which he has submitted to the Nelson Corporation Gas Committee—Mr. Mitchell says that the expenditure on revenue account was £157,794, or £24,804 more than the estimated amount; while the income was £152,137, or £8323 more than estimated. The result is a gross profit of £8539, and a net deficit of £5657. For the previous twelve months there was a net profit of £2076. In the period under review, 31,288 tons of coal were carbonized, the total cost of which delivered at the works was £76,288, or 48s. 9d. per ton, as compared with 39s. 2¾d. per ton for the previous year. The total wages paid were about £700 higher, at £33,467. The total quantity of gas made was 555,374,000 c.ft. (of which 5,738,000 c.ft. was carburetted water gas), which compares with 525,146,000 c.ft. in the preceding twelve months. The net return from residuals (£24,262) was 15s. 6d. per ton of coal carbonized, against 19s. 7¾d. a year ago. Unaccounted-for gas now stands at 6·1 p.ct. of the make, compared with 6·91 p.ct. The vertical retort installation at Brierfield is in good repair after six years' continuous use, with the exception of four retorts. During the past season, high-pressure lighting has been most popular; and many additional lamps have been erected.

Mr. Mitchell adds: "It is regrettable that there should be a deficit on the past year's working, which can only be attributed to the enormous expenditure incurred during the coal dispute. Owing to the inferior quality which we were reluctantly compelled to carbonize, the yield of gas per ton shows a decrease of 1558 c.ft. as compared with last year, with a corresponding reduction in the yield of residuals, accompanied by a heavy slump in the market prices of tar and sulphate."

Shrewsbury Gas Company's Special Order.—An extraordinary general meeting of the Shrewsbury Gas Light Company was held last Tuesday week, when a resolution proposed by Mr. J. B. Lloyd (the Chairman) was carried, that the draft of the Special Order for which application had been made to the Board of Trade under section 10 of the Gas Regulation Act, increasing the borrowing powers of the Company to one-half of the share capital, and for other purposes, be approved.

CITY AND GUILDS OF LONDON EXAMINATION PAPERS.

GAS ENGINEERING.

The following were the questions put by the Examiner, Mr. Samuel Tagg, of Preston, to candidates in the examinations in "Gas Engineering" which were held last Saturday week, under the auspices of the City and Guilds of London Institute. The maximum number of marks obtainable is appended to the different questions. Only eight questions to be attempted.

GRADE I.

1. Describe, and give an outline sketch of, a regenerative setting of retorts. (45.)
2. Give a description of any anti-dip arrangement with which you are familiar, and state the advantages it may possess over the sealed dip-pipe. (40.)
3. How is water gas manufactured, and what is its proper composition? (35.)
4. Describe the uses of the exhauster, and state how the "pull" is controlled. (40.)
5. Sketch and give figured dimensions of a tower-scrubber designed for a make of 40,000 c.ft. per hour. (35.)
6. How would you determine the amount of ammonia and sulphuretted hydrogen in crude gas, and what quantity would you expect to find at the outlet of the condensers and the inlet of purifiers? (30.)
7. How would you ensure the complete removal of sulphuretted hydrogen, and what are the chemical reactions involved? (45.)
8. What is a therm, and how is the thermal value of gas ascertained? What is the difference between the gross and the net calorific power? (30.)
9. Describe the construction of a wet gas-meter. (30.)
10. What are the essential principles of a well-constructed inverted gas-burner? (30.)

FINAL.

1. Give a detailed sketch with figured dimensions of an internal producer for a setting of retorts. (45.)
2. What conditions are essential in the working of a bench of horizontal retorts to obtain the maximum yield of therms per ton of coal? (45.)
3. Discuss the advantages of steaming in vertical retorts, stating the yield and calorific value of gas in relation to the quantity of steam used and the temperature of the combustion chambers. (40.)
4. Describe fully the method of working either a "blue" or carburetted water-gas plant. (35.)
5. Give detailed sketches showing the construction of a luteless purifier. (40.)
6. Describe the method for the complete analysis of gas, and give the composition of a coal gas of 500 B.Th.U. (30.)
7. How would you determine the percentage of sulphur in coal? State the quantity of sulphuretted hydrogen you would expect in crude gas, and the proportion removed by the condensers, scrubbers, ammonia washers, and oxide purifiers respectively. (30.)
8. Describe the construction and working of a gas-engine. (30.)
9. Give an outline sectional sketch of a two-lift holder and tank. (35.)
10. Give a description of a compensating station-governor. (30.)

GAS FITTING.

The following are the questions which were set by Mr. R. J. Rogers, of Birmingham, in the recent examinations in "Gas-Fitting." Not more than six questions were to be attempted. The maximum number of marks obtainable is affixed to each question.

GRADE II.

1. Describe, by means of a sketch, a U water-gauge, showing the position of the water line when subjected to a pressure of 37-10ths water-column. Explain the value of the gauge to a gas-fitter and the circumstances in which you would use it. (50.)
2. State the consumption of gas per hour of the following appliances: (*a*) "C" upright incandescent burner, (*b*) medium inverted burner, (*c*) nine-radiant gas-fire, (*d*) four-tube (double loop) gas-steam radiator 32 in. high, (*e*) 6-light medium mantle low-pressure gas-lamp, (*f*) 10-gallon wash-boiler, (*g*) 3½ in. ring burner on gas-cooker hotplate. (40.)
3. State the size of service you would lay from the main, and give the size of meter necessary to supply the appliances hereafter mentioned, assuming that two-thirds of the whole installation is required to be in use at one time. Give full details as to how you arrive at the size of service and meter required: One seven-radiant gas-fire; one 10-gallon wash-boiler; one cooking-stove with three boiling and one grill burner; five No. 2 size inverted burners; two No. 3 size inverted burners. (60.)
4. What are the advantages and disadvantages of flue pipes used in conjunction with gas cooking-stoves? (40.)
5. State the standard sizes of meters, giving the capacity per revolution and cubic feet per hour of each size. (50.)
6. Give a description of any type of thermostat used in conjunction with hot-water apparatus. Describe the method of working, and state under what conditions you would employ a thermostat in a domestic gas-heated hot-water installation. (50.)
7. Explain, step by step, how you would prepare and make the following joints: (*a*) Blown joints, (*b*) screwed joints, (*c*) flanged joints. What materials and tools are necessary for making each type of joint? (50).
8. The state of a 10-light meter on Dec. 23 being 199 and on March 23 387, what will be the cost of gas consumed during the period; the price of gas being 1s. 1½d. per therm, and the calorific value being 480 B.Th.U.? (40.)

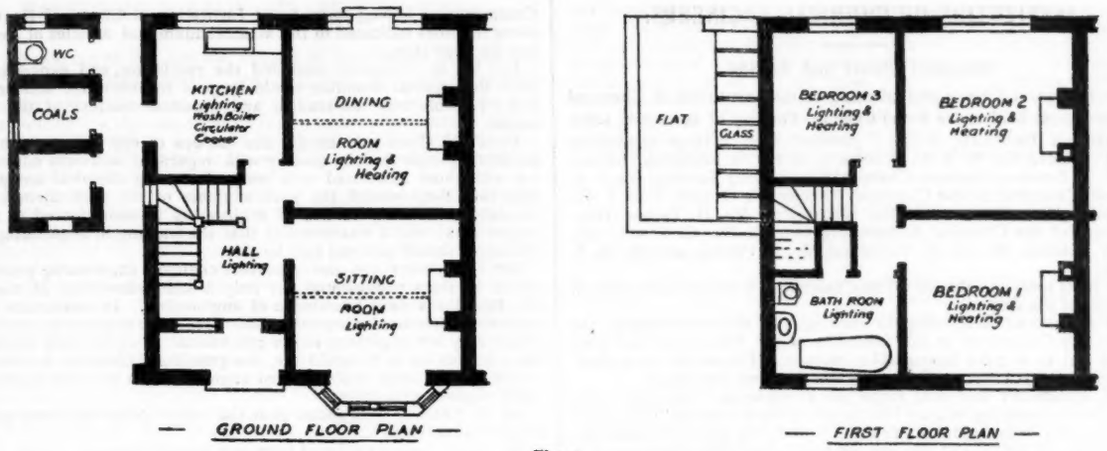


Fig. 1.

9. Give a short summary of the general advantages of gas lighting. (40.)

FINAL.

1. Fig. 1 shows the plan of a house in which gas is proposed to be used for the purposes named on the plan. Explain in detail: (*a*) The size of services required, (*b*) the position for the meter, (*c*) the size of meter, (*d*) the size of pipes to be run to each appliance and lighting position, (*e*) the type and size of gas apparatus you would fix in each room, (*f*) the consumption of each appliance to be installed. (60.)

2. State, step by step, how you would fix a geyser in a bathroom, capable of delivering 2 gallons of water per minute at 130° Fahr. State the gas consumption per hour of the geyser, and the size of gas and water supplies required. Assuming that the flue pipe is taken outside the building, what form of flue termination would you fix? (50.)

3. Complaints have been received from several consumers, in the same street, of oscillation in the gas supply to their premises. You are sent to investigate the complaints. Explain the possible causes of oscillation and how you would proceed to deal with them. (40.)

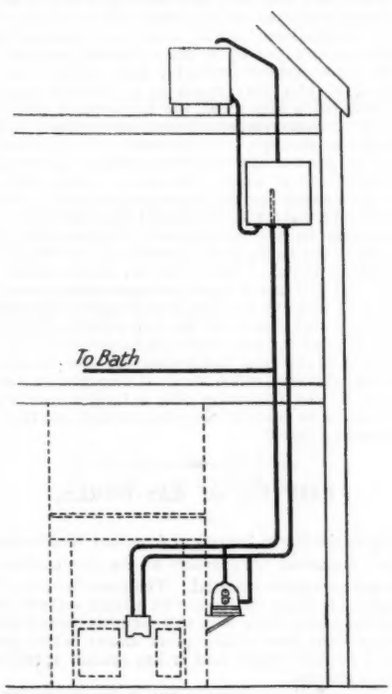


Fig. 2.

4. An inset gas-fire fitted with a silent burner has given entire satisfaction for some months, but lately has been getting much less efficient. The flames are becoming sluggish and giving less heat than formerly. What is the cause? (40.)

5. Assuming that you had completed the carcassing of a building which comprises three floors with a suite of five rooms on each floor, how would you test the installation for soundness? What type of apparatus would you use for the purpose if gas was not available? (50.)

6. A complaint is received of "No gas" at a gas-steam radiator. On examination it is found that the gas-nipple on the automatically controlled gas supply is full of water. State the probable cause, and how you would proceed to remedy the defect. (40.)

7. With gas at 11½d. per therm, what would be the cost of heating 20 gallons of water from 60° Fahr. to 160° Fahr. by means of a cast-iron circulator consuming 40 c.ft. per hour? Calorific value of gas, 480 B.Th.U. net; efficiency of apparatus, 65 p.ct. (50.)

8. What are the most frequent causes of complaints you are called upon to attend to on a gas-fire? Describe the steps you take to remedy each form of complaint. (40.)

9. Fig. 2 is a diagram of a domestic hot-water system to which has been fixed a gas-heated circulator. State if the system is properly connected to give best heating results. If not, describe the faults and explain how you would remedy them. (50.)

COKE AND BYE-PRODUCTS.

The City and Guilds of London Institute Final Examination in Coke and Bye-Product Manufacture was held last Wednesday; the Examiner being Mr. D. V. Hollingworth. The following were the questions put, and the marks obtainable.

1. Give a complete description of the process, apparatus, and materials employed in the chemical purification of benzole. Make a dimensioned sketch of a vessel suitable for washing 3000 gallons of spirit at a time. (35 marks.)

2. Compare the advantages and disadvantages of regenerative and waste-heat coke-ovens. Describe any method and apparatus employed for reversing the course of the heating and waste gases on the former. (40.)

3. Write an account of the most recent theories relating to the action of salty coals on refractory material. How would you ascertain the quantity of saline substances present in coal? How are they usually removed? (35.)

4. Describe the physical and chemical properties of a high-grade blast-furnace coke. Discuss shortly the effect of the following factors on the quality of coke: (*a*) The composition of the coal used, (*b*) weathering of the coal, (*c*) the time and temperature of carbonization, (*d*) excessive pressure in the oven, (*e*) improper quenching of the coke. (45.)

5. A cylindrical storage tank having half-spherical ends is 6 ft. in diameter and 20 ft. long in the centre. The measurements are internal. What weight of pure benzene will it hold when full? Suppose rectified oil of vitriol is substituted for the spirit, what weight will it hold? (35.)

6. A consignment of sulphate of ammonia consists of hard lumps, is bluish in colour, and has a destructive effect on the bags in which it is contained. What conditions during manufacture have caused these undesirable properties? Describe a method for rendering sulphate of ammonia granular and neutral. (45.)

7. Describe, with the aid of a sketch showing a longitudinal sectional elevation, the construction of any type of regenerative coke-oven. Give the dimensions of the carbonizing chamber, the heating and sole flues, and the regenerator. (35.)

8. Draw-up a statement showing the cost of the labour, materials, steam, and water necessary for the rectification of 20,000 gallons of crude 65 p.ct. benzole. Give the nature and amount of the purified and residual products that you would expect to obtain from this quantity of crude spirit. (40.)

9. Make a careful sketch, approximately to scale, of a 20-ton tar-still including all its adjuncts. Describe a method in common use for preventing the pollution of the atmosphere by noxious gases evolved during tar distillation. (40.)

10. Give a full description of the method of ascertaining the calorific value of any *one* of the following substances: (*a*) Coke, (*b*) creosote oil, (*c*) coke-oven gas. Sketch the apparatus required, and state the essential data of an actual test you have carried out. (40.)

Slot-Meter Rent Dispute.—A dispute has arisen at Penistone among those who use slot-meters on the question of paying rent; and a large number of people who have refused to pay the amounts demanded from them have received notice that, failing payment, legal action will be taken for the recovery of the sums due. The consumers have decided to fight the matter out; and it is understood that proceedings will be begun against a batch of twenty as a test case.

Doncaster Gas Prices.—It was decided, at a meeting of the Doncaster Town Council, on Tuesday of last week, that the price of gas for general and power purposes be reduced by 6d. per 1000 c.ft. from July 1, as follows: A flat-rate reduction of 3d. per 1000 c.ft., with a further reduction of 3d. by way of discount for the payment of accounts within fourteen days of demand. Mr. Morris said the Gas Committee were now very optimistic concerning the undertaking. They were getting better coal; and everybody, he thought, would agree that the gas had improved all round.

INSTITUTION OF CHEMICAL ENGINEERS.

Inaugural Dinner and Meeting.

The Inaugural Dinner and Meeting of the Institution of Chemical Engineers was held at the Hotel Cecil on Tuesday of last week, when Sir Arthur Duckham, K.C.B., presided over a large attendance which included Mr. W. J. U. Woolcock, M.P., Sir Frederick Nathan, Dr. B. T. Brooks (American Chemical Engineering Society), Mr. J. A. Reavell (Chairman of the Chemical Engineering Group), Prof. J. W. Hinchley (Hon. Secretary of the Institution), Mr. H. Talbot (Hon. Secretary of the Chemical Engineering Group), Mr. C. S. Garland, Mr. W. Macnab, Mr. W. W. Townsend, Mr. P. Parrish, and Mr. E. A. Alliott.

The loyal toast and that of "The Chairman" were formally given at the close of the dinner.

The President, in opening the meeting, said the steps taken by the Preliminary Committee in the formation of the Institution had been carried out in a most businesslike manner. He called upon Prof. Hinchley to give a report of the progress that had been made.

Prof. Hinchley said that since the Provisional Committee were elected at the meeting held on Nov. 9 last at the Engineers' Club, nine meetings had been held. At first the Committee acted with caution. But finding the amount of support obtained exceeded expectations, a definite and forward attitude was adopted; and it was decided to form the Institution of Chemical Engineers and incorporate it as a Limited Company—limited by guarantee, with the omission of the word "Limited" by permission of the Board of Trade. A clause was also inserted in the constitution referring to a future application for a Royal Charter. The draft Memorandum and Articles of Association and Bye-laws were submitted to all who had taken an active interest in the formation of the Institution, and also to all scientific societies having activities of a similar character, including, among others, the Institute of Chemistry, the Institution of Civil Engineers, and the Institution of Gas Engineers. The final draft of the Constitution was agreed upon; and the Solicitor had been instructed to take the necessary steps for registration. It was arranged that no members of any grade should be elected without the regular formality of application; and a Selection Committee had been appointed to draft application forms and deal with this question. It had also been agreed that the Provisional Committee should continue to act until the first annual general meeting. As to the objects of the Institution, it was the intention to encourage and help to create a new kind of professional man, the chemical engineer; and it would devote all its energies to producing and maintaining a high standard of educational, technical, and professional attainment.

The Hon. Treasurer (Mr. F. H. Rogers) said that the sum of £1425 had been guaranteed up to the present; but donations were still coming in. The actual cash received was £606, and the disbursements were £433; so that there was ample money in hand for the moment. The Committee, however, were anxious to secure the sum of £3000, which it was thought would be necessary to carry them over their initial difficulties, and at the same time allow them something in hand for future possibilities.

The Chairman said that the one thing that would kill the Institution was lethargy; and it was essential that they all realized that they must back-up the Institution with active support and active and constructive criticism. There was an absolute necessity for combining in the one individual the chemist and the engineer, in order to avoid the position which now existed of engineers who put forward ideas which were quite impossible from the chemical point of view, and chemists who put forward ideas which were quite impossible from the engineering point of view. The more industry was developed, the closer did the professions of engineering and chemistry come together. The object in forming the Institution was not that the members of it might have more letters to their names, but that they should be able to serve the industrial development of the country through the work which the Institution did. As to the Articles of Association, the liability of members was limited to £5. He hoped that when the Institution got going, they would be able to form some form of amalgamation of institutions—at any rate, so far as meetings were concerned. The overlapping of work of that sort between institutions was much to be deprecated; and he hoped that the work of the Institution of Chemical Engineers would lead to a union of institutions in some form. The great thing was that they should work amicably with the existing bodies.

Mr. W. J. U. Woolcock, M.P., who has acted as Vice-Chairman of the Provisional Committee, and taken the principal part in the drafting of the bye-laws, explained these, and expressed the view that they had been framed in such a manner as to leave the Council in future freedom of action in matters of detail which experience might show ought to be modified. The entrance fee had been fixed at £5 5s. for members, £3 3s. for associate members, £1 1s. for graduates, and 10s. 6d. for students, and the subscription at £5 5s. for members, £3 3s. for associates, £2 2s. for graduates, 10s. 6d. for students under 21 years of age, and £1 1s. for students over 21 years. There were also the usual provisions for the compounding of annual subscriptions, and the qualifications for membership, and the details of the holding of examinations were also set-out in the bye-laws.

Prof. Hinchley then read a letter from Prof. F. G. Donnan (Prof. of Inorganic Chemistry, University College, London), expressing his regret at being unable to be present and wishing all possible good luck and prosperity to the new Institution.

Sir Frederick Nathan said the Institution was undoubtedly going to be a most valuable one, because there was not the slightest doubt that we in this country were badly in need of men trained not only as engineers, but also as chemists. One point which occurred to him was the question of the training that was to be given; and this did not appear to have been dealt with, either in the Articles of Association or the bye-laws. Efforts must be made to devise a curriculum which would give a young man a complete chemical and engineering training at the same time; and he hoped the Institution would succeed in giving this country a body of trained engineers of the type he had mentioned. He proposed a resolution congratulating the Provisional Committee on having formed the Institution of Chemical Engineers along the lines indicated in the Memorandum and Articles of Association and bye-laws.

Dr. W. R. Ormandy seconded the resolution, and expressed the hope that special attention would be paid to encourage and help in every possible way the student and graduate sections of the Institution.

Dr. F. H. Carr said he did not see eye to eye with many of the academic people in this country with regard to technical education, nor with those associated with some of the big chemical companies who said they wanted the pure engineer or the pure chemist. At present the chemist, for lack of engineering training, feared to make suggestions; and it was essential that the training in engineering and chemistry should proceed side by side.

Mr. P. Parrish said the important chemical engineering problems ahead of them necessitated not only a wide knowledge of chemistry, but also a deep knowledge of engineering. In connection with synthetic ammonia, for instance, there were many engineering problems which very few engineers, either mechanical or civil, could tackle to-day; and so far as he could see, the question of chemical engineering would resolve itself into chemical engineers who had specialized in a certain sphere of activity.

Dr. R. Seligman suggested that the subscription had been placed at too high a level.

Mr. E. A. Alliott differed from this point of view.

The Chairman explained that the matter had received very careful consideration—indeed, there had been a number of suggestions that it ought to be higher.

Mr. C. S. Garland also supported the view that it was the wrong policy to fix subscriptions too low, and, on the general question of the need for training in chemical engineering, said that experience in America and Canada was that it was far more easy to place men from the universities who had been trained in chemical engineering than those who had been trained in chemistry only. A man with chemical and engineering training was worth three or four times the man without that knowledge.

Dr. B. T. Brooks said that although he was not in a position to speak as an official of the Chemical Engineering Society of America, he did, on their behalf, welcome the formation of the new Institution, the success of which he felt it would be unreasonable to doubt. The question of the training of chemical engineers had been touched upon; and one of the chief objects the American Society had was to improve the training of chemical engineers.

The Chairman said it was quite evident that they could now go ahead with the Institution, and the necessary steps would be taken to that end. Something had been said about people who were interested in manufacturing chemical commodities; but he wished to emphasize the fact that chemical engineering went much further than this. He himself had been brought up in the only real chemical engineering profession in this country—namely, gas engineering, which had always seemed to him very much of a chemical engineering profession. It had made him speak the language of the chemist; and it had been of immense value to him as an engineer in assisting the chemist all the way through. At the same time, chemical engineering was not to be confined to chemical businesses, as chemical businesses were understood. Steel works, coke-oven works, and many other works were all waiting for the chemical engineer. Every engineer must, in the future, have a knowledge of chemistry, and every industrial chemist must have a knowledge of engineering. Hitherto the chemist had sat in the background, because he was afraid to come into the works and do things. There was no doubt about that, in his opinion. He had met many works chemists who were afraid in this way, because they had not sufficient knowledge of engineering.

Prof. Hinchley said that it was on his mind to associate in some way the name of Lord Moulton with the formation of the Institution, because he was largely the inspiration for the Institution. Lord Moulton had had this idea in his mind all through the war.

A suggestion by the Chairman that a further meeting should be held in the autumn to consider the position then existent was agreed to; and the meeting closed.

PAINTING OF GAS-WORKS.

At a meeting of the Royal Society of Arts, last Wednesday, Mr. Noel Heaton, B.Sc., discussed the question of the production of titanium oxide and its use as a paint material. The manufacture of this in the form of a pigment is being carried out on a large scale in Norway; and it is claimed that paints made with this pigment possess extraordinary opacity (greater than that of any other known white pigment), low specific gravity (which means that it has greater spreading power), and fine state of division.

An interesting point was brought out in the discussion by Mr. R. Bruce Anderson, who said that in the nineties he had used considerable quantities of paint which was represented to him as having a base of titanium oxide; and he was strongly urged to employ it in its natural colour. This was a deep-blue slate; and he had used a lot for the painting of gas-works. He had found that it was easily applied by the ordinary labouring man at the gas-works, and lasted very well on the holders. It adhered to the iron; and he had specified it in many gas-works. Eventually, however, he gave up the use of it, for a peculiar reason. Managers of gas-works had often to live on the works; and their wives complained of the funereal aspect. However, he had used it for ten years, and found it admirable. It also wore well; and the surface was in excellent condition for repainting. One coating was sufficient when repainting.

Buxton Gas Consumption.—It was reported at a meeting of the Buxton Town Council last week that the make of gas for the twelve months ended March 31 was 159,544,000 c.ft.; that for the previous year having been 145,171,000 c.ft. This represents an increase in consumption for the past year of 14,373,000 c.ft.

TARRED ROAD DRAINAGE AND FISH LIFE.

At the meeting of the London Section of the Society of Chemical Industry on Monday, May 1, Dr. J. J. Fox, of the Government Laboratory, gave an account of the experimental work which he had carried out during the past three or four years, in conjunction with a Committee appointed by the Road Board and the Ministry of Agriculture and Fisheries, in regard to the effect of the drainage from tarred roads upon fish life in adjacent streams.

The experiments were carried out in the laboratory and also on what may be termed a practical scale in fish-ponds into which the drainage was run direct off sections of a road. The work, of course, was the result of the difficulties which have arisen between road engineers and owners of streams in certain parts of the country, and of certain legal proceedings. While the paper was mainly concerned with a description of the chemical tests that were evolved for determining the dangerous constituents in tar from the point of view of their effect upon fish life, there was also a large amount of general information which is of considerable interest. For instance, it was found that the phenolic bodies and acridine are the two most dangerous constituents in coal tar so far as they affect fish life in streams, the latter the more dangerous of the two; and although samples of the tar supplied by the South Metropolitan Gas Company were used (so-called synthetic tar) from which the tar acids, or most of them, had been removed, yet Dr. Fox said he found it impossible, much to his regret—because they all wished to do everything possible to develop the tar industry in this country—to give any tar a clean bill of health in regard to its dangerous constituents. It was also found, however, that phenolic bodies are given off by vegetable substances which so commonly exist in streams, so that the existence of phenols in stream water, even if the stream is in the vicinity of a tarred road, did not necessarily imply that the pollution came from the drainage off the tarred road.

Hence, the author set himself the task of devising a method of estimating quantitatively the phenols and also of distinguishing between the phenolic bodies from coal tar and the phenolic bodies from vegetable substances. In that he was quite successful; but the general conclusion he arrived at was that as the number of cases in which there are streams in the vicinity of tarred roads are comparatively few, it would be in the best interests of everybody, in order to avoid disputes and litigation, as stream owners blamed the roads if they found one dead fish, to avoid the use of tar in these cases—at any rate, until such time as tars can be obtained free from these dangerous constituents. Incidentally, he mentioned that certain highway authorities, anxious to avoid these disputes, had refrained from using tar on certain roads, with the result that the inhabitants of the villages were getting quite Bolshevistic towards the road authority on account of the dust created by motors.

Another point made clear by the investigations was that the drainage from tarred roads is only dangerous when it comes off a road that has been newly tarred, or from a road that has begun to break-up under the action of the traffic. As the bulk of the tar used for road surfacing consists of hydrocarbons which are not readily determined when associated with other organic substances, attention was concentrated upon tar acids and tar bases, which form products which can either be determined calorimetrically or separated and weighed. The tests, of course, will be extremely useful in cases of dispute; but the general effect of Dr. Fox's conclusion is that it is better to avoid disputes by avoiding tar in the few cases in which disputes could arise.

TRADE NOTES.

Tully Gas Plants.

A repeat order has been received by Tully Gas Plants, Ltd., of Newark-on-Trent, from the South Oxfordshire Water and Gas Company, Goring-on-Thames, for a Tully set of 150,000 c.ft. per day capacity.

Lassen Meter and Engineering Company.

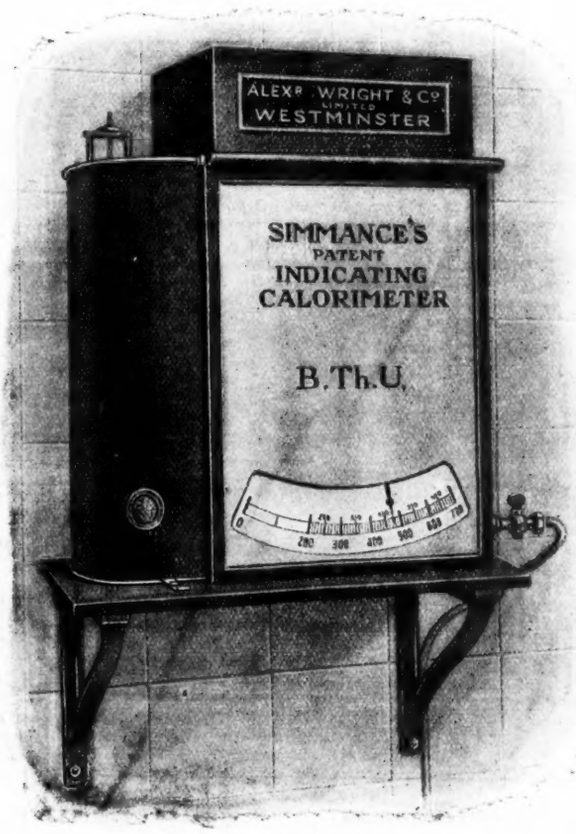
We are informed that the Lassen Meter and Engineering Company have been acquired by Messrs. James Gordon & Co., Ltd., of Windsor House, Kingsway, W.C. 2. Mr. J. J. Lassen has accepted the position of Joint Managing Director, and will personally conduct the section of the business dealing with boiler efficiency appliances and instruments. The latter Company also specialize in the design and manufacture of water power plant.

Curtis's and Harvey's Mantles.

Owing to the continued importation of foreign mantles, Messrs. Curtis's and Harvey, Ltd., have been compelled to close-down their well-known factory at Dartford. First opened in 1906 for the manufacture of "Ironclad" mantles, the business extended to considerable proportions, until Messrs. Curtis's and Harvey became the largest manufacturers of gas-mantles in the British Empire; but during the last year or two the abnormal rate of exchange has been all in favour of the importer. Messrs. Curtis's and Harvey, however, are still able to meet all the demands for gas-mantles at their large factory at Earlsfield.

Munich Chambers at Darwen.—Mr. G. Pickup referred in the Darwen Town Council to the year's result in the Gas Department, and said there was a loss of £4338. A suggestion had been made inside and outside the Council Chamber that the Munich system of carbonization was not fulfilling expectations. He had no hesitation in stating that this plant was doing what was expected of it, both in producing gas and in respect of working costs. The outstanding cause which had contributed to the year's loss was the rapid falling-off in the selling price of residuals, which accounted for £8202.

CALORIFIC POWER AT A GLANCE.



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SOLE LICENSEES.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

May 8.

The average values for gas-works products during last week were: Gas-works coal tar, 30s. to 35s. Pitch, East Coast, 60s. to 62s. 6d. f.o.b. West Coast—Manchester, 57s. 6d. to 60s.; Liverpool, 57s. 6d. to 60s.; Clyde, 59s. to 61s. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4¼d. to 4½d.; salty, 3⅞d. to 4⅛d. Scotland, 3⅞d. to 4d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., 1s. 10d. to 2s. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

The London Market for Tar, Tar Products, and Sulphate.

London, *May 8.*

In the London tar products market, pitch is rather easy for early shipment, and possibly some supplies might be obtained at 70s. to 72s. 6d. net per ton f.o.b. makers' works. The stocks of creosote in London are rapidly disappearing; and the price is firm at 6d. net per gallon in bulk *ex* works. There is nothing new to report as to benzole, toluole, and solvent naphtha. Anthracene has been totally neglected for several months.

There is still some demand for sulphate of ammonia for the home farmers.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, for the month of March, according to the sliding-scale, was £2 11s. 0·59d.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is little change since last writing on the situation relating to tar products. Pitch has become somewhat irregular. Business has been done at the East Coast at 60s. per ton, though in other directions 67s. 6d., and even 72s. 6d., is still being asked. Solvent naphtha continues without any change in prices, and some transactions in heavy naphtha have been done at 2s. per gallon. Naphthalene is still active, with crude at £5 to £6 10s., and refined at £17 per ton. Creosote is rather wanted for early delivery at 4½d. to 5d. per gallon according to position. Cresylic acid remains at 2s. for pale 97/99, and 1s. 10d. for 95/97. Carbolic acid is as flat as ever. Supplies of benzole 90's are increasing, and it is now difficult to find buyers at 2s. per gallon. Pure benzole is also in poor demand. Intermediate products have hardly changed during the last week. Export inquiries are being received, and a few orders are being booked. There is practically nothing doing on home account.

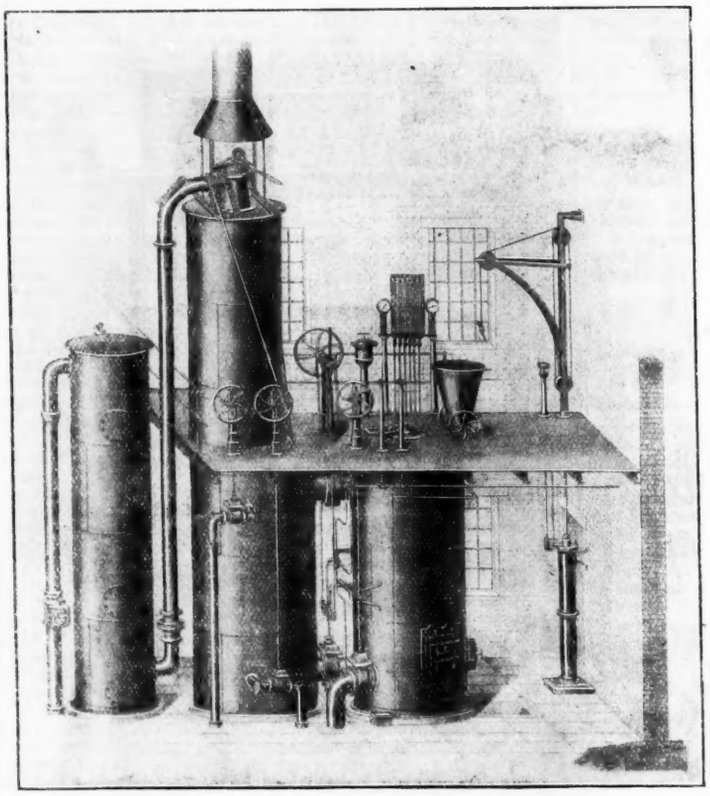
Sulphate of Ammonia.

The position in this material has not changed; and if any market really exists at the moment, it is difficult to find it. As, however, much is required, there is none available except for orders already booked, owing to the fact that most of the coke-ovens are idle at the present time. The result of this position is that sulphate of ammonia is in many cases being replaced by nitrate of soda, which fact is causing a slight upward movement to the last-named fertilizer. From America it is reported that the shortage there is causing producers to refuse all further export business at present, as the home demand must be met first. Even with this it must be some considerable time before those who wish to buy now can obtain their supplies. The present position of sulphate of ammonia (as has already been pointed out) should be a warning to consumers not to delay the placing of orders. Many things have brought about the present shortage; and manufacturers cannot be held responsible for any of them.

The Bridlington Town Council have decided to oppose the application of the local Gas Company for a Special Order to enable them to extend their services and to raise additional capital.

In connection with the new issue of £15,000 of 7 p.ct. redeemable preference stock of the Felixstowe Gas Light Company, made by Messrs. A. & W. Richards, tenders for over £35,000 were sent in, ranging from £110 per £100 down to the minimum price of par. The lowest price at which any stock was allotted was £100 15s.; and the average price was £102 1s. 7d., at which the yield to the investor is £6 13s. 7d. p.ct.

By order of the Directors, Messrs. A. & W. Richards are offering for sale by tender £10,856 of 6½ p.ct. redeemable preference stock and £5430 of 6 p.ct. redeemable debenture stock in the Weston-super-Mare Gas Light Company. The minimum prices of issue are for the preference stock at par, and for the debenture stock £99 per £100; both stocks to be redeemable at par on July 1, 1932. The sale of gas in the last pre-war year (1913) was 237 million c.ft., while for last year it reached 322 millions. The new capital is required to pay for extensions of works and plant rendered necessary by the constantly increasing demand. Wednesday morning, May 17, is the latest time for the receipt of tenders.



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

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Commercial Gas Company's Calorific Value.—The Gas Referees regret to find that in the report already issued by them on the official testings of the Commercial Gas Company's gas for the quarter ended March 31 [*ante*, p. 278] there was an error, due to the inversion of two figures in copying. The average calorific value for the quarter was 502·5 B.Th.U. gross, and not 505·2 B.Th.U. gross as stated in the report.

Peterborough and the Therm Basis.—The necessity of safeguarding consumers' interests in regard to the illuminating power of the gas supplied at Peterborough was urged at the last meeting of the City Council, when a communication was received from the Gas Company announcing their intention to apply to the Board of Trade for an Order permitting future charges to be made on the basis of thermal units, and to modify the rates accordingly. It was determined to obtain expert advice to show how consumers would be affected by the proposed re-arrangement.

Hong Kong and China Gas Company, Ltd.—The report for the year ended Dec. 31 last, which was presented at the annual meeting on Monday, stated that the quantity of gas sold at Hong Kong was 8 p.ct. less than in 1920; but development of the use of gas for cooking and water heating encourages the hope that business will now progress. The consumption at Kowloon was 25 p.ct. higher than in the previous year; and a new holder is being supplied for erection there to meet the increasing business. The cost of coal per ton was slightly less; but a contract was recently made for a twelve months' supply at a price considerably lower than that for 1921. Exchange fell greatly; and the balance of revenue accounts was converted at 2s. 7½d. per dollar, as compared with 4s. 4d. in 1920. The Hong Kong balances at Dec. 31 were valued at 2s. 7d. per dollar. There was a balance of net revenue amounting to £42,712, out of which the Directors recommended the payment of a dividend at the rate of 7½ p.ct. per annum (less income-tax).

STOCK MARKET REPORT.

THE week just closed on the Stock Exchange opened with fair promise of steadiness and more activity; but this prospect was soon obliterated by serious apprehension arising out of the miserable state of things at Genoa. Prices in every market of consideration fell freely; but happily the worst was over before the close, when the alarm somewhat abated. In Home Government issues, the big four (except Funding) went down; their Friday's figures being: Consols 58½-58$\frac{11}{16}$, War Loan 98$\frac{15}{16}$-99$\frac{3}{8}$, Funding 87$\frac{7}{8}$ 88$\frac{1}{4}$, Victory 89$\frac{1}{4}$ 89$\frac{3}{8}$. Bonds, Colonials and Indian, moved irregularly.

Business in the Gas Market was decidedly quieter, even if allowance be made for the Exchange being closed on May 1, according to the annual custom. But this little pause did not affect the strength of the market; the still rising tide of prices continuing in full action. In the London Companies there was no change recorded, they having done very well already in the matter of advances. In the Suburban and Provincial group there was great buoyancy. Aldershot rose 5. Bournemouth 5 p.ct. 1, Ilford "A" and "C" 10, ditto "B" 6½, Newcastle 4½, ditto debenture 3½, South Suburban 2, Tottenham "A" 8, ditto "B" 2, ditto debenture 2½, Wandsworth "A" 4, ditto "B" 6, ditto "C" 4, ditto Wimbledon and Epsom 5 each. In the Continental, Imperial and Union were steady and unchanged, and European rose ½. In the remoter world, Primitiva preference rose $\frac{1}{16}$.

Bargains done for cash during the week were as follows: On Tuesday, Alliance and Dublin 65, 65½, 65⅝, Bombay 4⅝, British 29⅝, 30, European 11⅞, 12, 12¼, Gas Light ordinary 89½, 89⅝, 90, 90⅛, 90¼, 90⅜, 90¼, ditto maximum 64⅜, ditto debenture 63, Imperial Continental 167, 168, 168½, 169, 169¾, 169½, 170, 170½, Metropolitan of Melbourne 96¼, Primitiva preference 53s. 9d., South Metropolitan 95, 95¼, 96, 96½, South Suburban 97½, 100, 100½ Swansea 7 p.ct. preference 102⅜ 103 Southgate 7 p.ct. 108. On Wednesday, Brentford "B" 93 European 11⅛ 12⅛, Gas Light ordinary 89½, 89⅝, 89⅜, 90, 90⅛ 90¼ 90½, ditto maximum 64¼ ditto preference 81⅛ Hastings and St. Leonards 3½ p ct. 50, Imperial Continental 169½, 170, 170½, 171, Primitiva 16s., ditto preference 55s., 56s 3d., South Metropolitan 95, 95⅛, 96, Swansea 7 p.ct. preference 102 102¼, Liverpool 7 p.ct. preference 105½, 106½, 106⅜ Malta and Mediterranean preference 68½, 70, Southgate 10 p.ct. maximum 153½. On Thursday, Alliance and Dublin 65, British 30⅛, Cape Town preference 5, Continental Union 40, European 12, 12⅛, Gas Light ordinary 89½, 89⅝, 90, 90¼, 90⅛, ditto maximum 63½, 64¼ 64½ 65½, ditto debenture 63, Hastings and St. Leonards 3½ p.ct. 55, Imperial Continental 169, 169½, 170, Primitiva 16s, South Metropolitan 95¼ 95½, 95⅝, 96, ditto 6½ p.ct. debenture 106⅜ South Suburban 100, 100½, Wandsworth Wimbledon 74½, British (Hull) 3½ p.ct. debenture 61½, Swansea 7 p.ct. preference 102, 102⅜, ditto 6½ p.ct. debenture 106½. On Friday, Continental Union 39, 40, European 12$\frac{1}{16}$, 12$\frac{1}{8}$, 12¼, 12$\frac{5}{16}$, Gas Light ordinary 90, 90⅛, 9 ¼, 90⅜, 90⅝, 90⅞, 91, ditto maximum 64¼ 64½, ditto preference 81½, 82, 82½, Imperial Continental 169, Newcastle debenture 70, Primitiva preference 53s. 9d., South Metropolitan 95¼, 95½, Tottenham "A" 105, ditto "B" 89, 89½, 90, ditto debenture 61, Swansea 7 p.ct. preference 102⅜, Guildford 78, Sheppey 5 p.ct. 60.

In the Money Market, the position was very comfortable; there being abundant supplies demanding employment, though in mid-week there was a slight promise of more fineness. Discount rates weakened proportionately. The Bank rate is 4 p.ct., as fixed on April 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref. .	..	70—75	...
1,551,868	,,	Apl. 12	2½	3$\frac{1}{16}$%	Alliance & Dublin Ord.	59—64	62—67	65—65½
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	55—60	...
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd. . . .	5½—6½	4½—4¾	4½
100,000	5	Feb. 23	16	7½%	Bournemouth Gas and Water { 5 p.c. . .	..	10½—11½	...
383,110	10	,,	7	7%	{ B 7 p.c. .	15—15½	9—10	...
115,000	10	,,	6	6%	{ Pref. 6 p.c.	13½—14	8—9	...
162,065	—	Dec. 30	—	4%	{ 4 p.c. Deb.	..	65—70	...
992,045	Stk.	Feb. 9	14	56/-	Brentford A Consolid. .	261—266	88—93	
734,920	,,	,,	11	55/-	Do. B New . .	204—209	88—93	93
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	80—85	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb. .	91—93	75—80	...
214,775	,,	Mch. 15	11	11%	Brighton & Hove Orig. .	208—213	157—162	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	115—120	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max. . .	..	..	...
530,000	20	Mch. 15	12½	10%	British	44—45	29—31	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—72	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—60	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	6—7	...
100,000	10	Apl. 27	—	4%	Do. 4½ p.c. Pref.	4—6	5—6*	5
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	65—70	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	..	...
1,513,280	,,	Mch. 15	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	88—93	...
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	88—93	...
475,000	,,	—	3	3%	Do. 3 p.c. Deb. Stk.	60½—71½	57—62	...
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	37—42	39—40
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	50—55	...
51,600	,,	Feb. 23	15	15%	Croydon A 10 p.c. . . .	..	185—195	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	..	145—155	...
492,270	Stk.	—	6	4½%	Derby Con. Stk. . . .	123—125	80	...
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	63	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd. . . .	17½—18	12—12½	11⅞—12$\frac{5}{16}$
16,298,975	Stk.	Feb. 23	4/17/4	46/8	Gas Light and Coke { 4 p.c. Ord . . .	98—102	89—91	89½—91
2,600,000	,,	,,	3½	35/-	{ 3½ p.c. max. . .	76—79	63—66	63½—65½
4,062,235	,,	,,	4	4%	{ 4 p.c. Con. Pref.	96—99	78—83	81½—82½
4,674,850	,,	Dec. 15	3	3%	{ 3 p.c. Con. Deb.	72½—74½	58—63	60—63
130,000	,,	Dec. 11	10	10%	{ 10 p.c. Bonds .	..	..	...
82,500	,,	Sept. 14	5	3½%	Hastings & St. L. 5 p.c.	..	..	...
258,740	,,	Mch. 15	3½	2½%	Do. 3½ p.c.	87—89	45—55	50—55
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5½—6½	...
86,600	Stk.	Mch. 15	9	9½%	Hornsey 7 p.c. . . .	..	100—105	...
131,000	,,	,,	7½	7½%	Ilford A and C	151—154	120—130	...
65,780	,,	,,	6½	5½%	Do. B.	115—118	100—110	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. . .	92—94	65—70	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental .	130—160	167—172	167—171
404,800	,,	Feb. 9	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	72—77	...
235,242	,,	Mch. 15	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	83—88	..
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	..	...
					{ B.	146—148	..	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	,,	Feb. 23	7/5/6	6%	Maidstone 5 p.c. . .	..	80—85	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb . .	..	48—51	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	2½—3½	..
250,000	100	Apl. 3	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	91—98	96½
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd. . .	11½—12	61—66	...
1,875,892	,,	Feb. 23	4½	4½%	Newcastle & Gatsh'd Con.	98½—99½	79—80	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	69—71	70
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	12½—13	...
55,940	10	Mch. 15	7/14/0	10/12	,, ,, 7 p.c.	14—15	10—11	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd. . . .	117—122	90—95	...
60,000	5	—	10	—	Ottoman, Ltd. . . .	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonh'se 5 p.c.	..	69—71	...
60,000	50	Mch. 15	13	62/6	Portsea Island, B . .	128—131	87—90	...
100,000	50	,,	12	57/6	Do. C . .	118—121	78—83	...
249,980	5	—	8	—	Primitiva Ord. . . .	5½—6	½—¾	16/-
499,960	5	—	5	—	Do. 5 p.c. Pref. .	4½—5	2½—2⅞	53/9—56/3
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb. .	91—93	70—75	
600,000	Stk.	Jan. 26	4	4%	Do. ,, ,, 1911	..	55—60	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	54—60	...
150,000	10	Mch. 30	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	5½—6½	...
125,000	50	Jan. 3	5	5%	{ 5 p.c. Deb.	47—49	36—39	...
135,000	Stk.	Mch. 15	10	5%	Sheffield A	223—224	89—92	.
209,984	,,	,,	10	5%	Do. B	222—224	89—92	...
523,500	,,	,,	10	5%	Do. C	220—222	89—92	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c. . . .	..	..	...
90,000	10	Oct. 28	9	8%	South African . . .	10½—11½	7—9	...
6,609,895	Stk.	Feb. 9	5/4/0	5%	South Met Ord. . . .	111—113	95—98	95—96½
250,000	,,	Jan. 12	—	5%	Do. Red. Pref. .	..	96—98	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb. .	72½—74½	60—63	...
224,820	,,	Feb. 23	8½	8½%	South Shields Con. Stk.	157—159	106—108	...
1,087,795	,,	,,	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	97—102	97½—100½
368,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	87—92	...
647,740	,,	Nov. 16	5	4%	Southampton Ord. . .	99—102	61—64	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	60—62	...
120,000	,,	Feb. 23	—	7½%	Tottenham { A 5 p.c. .	135—138	103—108	105
782,275	,,	,,	6	5½%	District { B 3½ p.c. .	115—117	87—92	89—90
181,255	,,	Dec. 15	4	4%	{ 4 p.c. Deb.	87—89	70—75	72
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mch. 15	5	3½%	Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mch. 15	8½	66/3	Wandsworth A 5 p.c. .	151—156	89—94	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c. .	129—134	78—83	...
108,075	,,	,,	—	46/4½	Do. C.	..	75—80	...
140,865	,,	,,	—	46/4½	New Ordinary . . .	..	63—66	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c . . .	117—122	75—80	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c. . . .	121—126	75—80	...
88,416	,,	Dec. 30	3	3%	3 p.c Deb. Stk. . .	66—69	53—56	...

* Ex Div.

Primitiva Gas Company of Buenos Ayres.

The twenty-first annual meeting of the Company will be held next Tuesday, the 16th inst., at River Plate House, Finsbury Circus. The Directors will submit an improved report; as against a loss of £95,510 for the previous year the accounts to Dec. 31, 1921, show a profit of £968. Deducting this from the debit balance of profit and loss account at December, 1920, of £462,677, there remains a debit of £461,709. Cheaper coal and freights were not obtainable till last October. Capital expenditure has been reduced to a minimum; the works having been maintained in order out of revenue, and only four miles of mains having been added—making a total of 1139 miles. It has not been possible to make any provision for *retiro* amortization. Only slight progress has been made towards concluding the agreement under clause 5 of the contract with the Municipality of Buenos Ayres—determining the Company's capital for amortization purposes in the event of the Municipality taking-over the undertaking. The sale contract of the electric section of the Deutsch-Uberseeische Elektricitäts Gesellschaft has been transferred to the Compañia Hispano-Americana de Electricidad, which took over the assets and liabilities of the German company. The Spanish company have agreed to pay an additional £2500 per annum for the duration of the contract.

Cheaper Gas in Belfast.—The Belfast Corporation have reduced the price of gas by 8d. to 3s. 9d. per 1000 c.ft., less 20 p.ct. discount for prompt payment, or 3s. net.

Stafford Price Reduction.—From the March readings of the meters, the price of gas to quarterly consumers at Stafford is reduced by 6d. per 1000 c.ft.

Cheaper Gas at Dudley.—The Dudley Gas Company have reduced the price of gas to domestic consumers by 3d. per 1000 c.ft., and to industrial consumers by 6d., from the March reading of the meters.

Yorkshire Price Reductions.—The Batley Town Council have approved an increase of the discount on gas accounts to 5d. per 1000 c.ft. The present price is 6s. Alderman Stubley (the Chairman of the Committee) said they could not claim that the finances of the department fully justified the change; but they were yielding to the cry for concession, and hoped it might be for the best. Mr. J. Ramsden held that the price of gas ought to be reduced 1s. per 1000 c.ft., as well as giving the increased discount. Mr. J. E. Oldroyd went further and suggested that the price should be reduced by 2s. Alderman Stubley said if they could suspend sinking fund they might be able to reduce the price 2s.; but this would be bad finance. The York Gas Company have decided to reduce the price of gas, as from the June meter readings, by 0·65d. per therm, making the charge to ordinary consumers 10·6d. per therm, with an addition of 0·8d. per therm for the villages of Haxby, Wiggington, and Strensall.

Cheaper Gas for Power, &c., at Derby.

The Derby Gas Light and Coke Company give notice of a reduction of 1d. per therm in the price of gas used for motive power and manufacturing purposes, if registered by separate meter. From the March reading of meters, therefore, the price of gas will be charged in accordance with the following revised scale:

—	Per Therm.	Discount.	Equals per 1000 Cubic Feet.
		P.Ct.	s. d.
If the consumption be under 500,000 c.ft. per quarter	8d.	—	3 2·40
500,000 c.ft. and under 1,000,000 c ft. per quarter	8d.	2½	3 1·44
1,000,000 c.ft. and under 2,000,000 c.ft. per quarter	8d.	5	3 0·48
2,000,000 c.ft. and under 4,000,000 c.ft. per quarter	8d.	7½	2 11·52
4,000,000 c.ft. and upwards per quarter	8d.	10	2 10·56

(Less Discount.)

These rates are for gas of 480 B.Th.U. declared calorific value; the quality actually supplied being about 500 B.Th.U.

Mr. T. B. Parsons, Secretary of the Pontypool Gas and Water Company, has been presented with a gold watch by the parishioners of Trevethin Church, in recognition of his services as Vicar's Warden for a period of 21 years.

It is reported that the South Wales colliery owners have given fourteen days' notice of their intention to terminate the contracts of the men engaged on the coke and bye-product plants, unless a reduction of 17 p.ct. in wages is accepted.

The difficulties which have been the unavoidable sequel to the reconstruction following the installation of new retorts at the Stockton Corporation Gas-Works are now being rapidly overcome; and both quality and pressure are said to be better than has been the case for years past.

It would appear from figures submitted to the Llandudno District Council that the gas undertaking is now in a better position than last year, as the gas made per ton of coal is 18,649 c.ft., against 15,086 c.ft. before; and the saving in coal and wages, compared with four weeks in March, 1921, is £456.

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Continued on p. 344.